

## **7. Appendices**

	<u>page</u>
<b>7.1. Status of Waste Management in Wisconsin (includes table of contents)</b>	<b>1</b>
<b>7.2. Issue Papers on the Future of Waste Management</b>	<b>28</b>
<b>7.3. External Meeting Notes, July 1998</b>	<b>36</b>
<b>7.4. External Feedback on Draft Issue Papers</b>	<b>40</b>
<b>7.5. Stakeholder Post-Meeting Evaluations</b>	<b>41</b>
<b>7.6. External Meetings on Cost Effectiveness, August 1998 and February 1999: Key Factors Driving Cost Effective Programs and Common Themes</b>	<b>46</b>
<b>7.7. Summary of Survey on Costs of Twenty Five Municipal Programs, March 1999.</b>	<b>53</b>
<b>7.8. Shared Vision and Goals to Improve Waste Management Meeting Notes (DNR, UW-Extension)</b>	<b>54</b>

## **Appendix 7.1. Status of Waste Management in Wisconsin - Table of Contents**

	<b><u>page</u></b>
<b>Appendix 7.1. Status of Waste Management in Wisconsin</b>	<b>1</b>
<b>7.1.1. Legal Framework for Waste Management</b>	<b>2</b>
<b>A. Overview and History</b>	<b>2</b>
<b>B. Recycling</b>	<b>4</b>
<b>C. Composting</b>	<b>5</b>
<b>D. Tires</b>	<b>5</b>
<b>E. Other Waste Treatment</b>	<b>5</b>
<b>F. Beneficial Reuse</b>	<b>6</b>
<b>7.1.2. Results of Landfill Diversion Efforts</b>	<b>7</b>
<b>A. Reduction and Reuse</b>	<b>7</b>
<b>B. Recycling and Composting</b>	<b>8</b>
<b>C. Per Capita Generation and Comparison to National Performance</b>	<b>10</b>
<b>D. Diversion Rates in Terms of Waste Disposal Prevented</b>	<b>11</b>
<b>7.1.3. Infrastructure, Costs, and Markets</b>	<b>11</b>
<b>A. Overview</b>	<b>11</b>
<b>B. Recycling</b>	<b>12</b>
<b>C. Composting</b>	<b>14</b>
<b>D. Biopile Treatment</b>	<b>15</b>
<b>E. Medical and Infectious Waste</b>	<b>16</b>
<b>F. Beneficial Reuse of Industrial By-Products</b>	<b>16</b>
<b>G. MSW Combustors and Refuse Derived Fuel</b>	<b>17</b>
<b>H. Tires</b>	<b>17</b>
<b>I. Non-Hazardous Solid Waste Landfills</b>	<b>18</b>
<b>J. Incineration</b>	<b>23</b>
<b>K. Household Hazardous</b>	<b>26</b>
<b>L. Hazardous Waste</b>	<b>27</b>

## **7.1. Status of Waste Management in Wisconsin**

### **7.1.1. Legal Framework for Waste Management**

#### **A. Overview and History**

Prior to the 1960s, solid waste management regulation in Wisconsin was exclusively the domain of local government. In response to increasing concerns regarding public health and the environment, Wisconsin solid waste management legislation was first enacted in 1967, and expanded in 1971 and 1973. This legislation authorized the DNR to regulate the creation and operation of solid waste disposal sites and required the DNR to establish minimum standards for the “location, design, construction, sanitation, operation and maintenance of solid waste disposal sites and facilities” (Chapter 83, Laws of 1967, s.144.43, Stats.). The DNR was authorized to issue annual licenses, collect fees for the licensing program, and conduct and/or promote research related to solid waste disposal.

The 1971 amendments gave county governments the authority to “plan, establish, and operate solid waste collection, transportation, and disposal systems, either alone or in cooperation with other units of local governments” (Wisconsin Legislative Council, 1976). Although the amendments gave this authority to county governments, such actions were not mandated. Significant additional Wisconsin legislation related to solid and hazardous waste landfills was enacted during the next several years. Laws requiring financial responsibility, establishing the Waste Management Fund, and initiating landfill siting requirements were enacted in 1978. In 1982, laws were enacted providing for negotiation/arbitration by local governments, and contested case hearings, both related to landfill siting. Disposal needs and flow control laws were passed in 1983, and in 1984, the Environmental Repair Program was established. The groundwater law, applicable not only to landfills, was also enacted in 1984.

The financial responsibility law required landfill owners to provide proof of financial responsibility for both the cost of landfill closure and the cost of maintenance after closure (post-closure long-term care). The post-closure long-term care period was originally established as 30 years, but that period of time proved to be insufficient, as landfills closed for 30 years or longer were seen to still be producing gas and leachate. Legislation was later enacted to extend the post-closure long-term care period to 40 years.

On the National level, the Resource Conservation and Recovery Act (RCRA) was enacted by Congress in 1976. Among many other requirements, this legislation differentiated hazardous waste from other solid wastes, established standards for the handling and disposal of hazardous wastes, and created cradle to grave responsibility for wastes. For non-hazardous solid waste, this national legislation had only minor effect in Wisconsin, as the state had already passed similar laws. However, Wisconsin's requirements for hazardous waste (referred to as “toxic wastes” in Wisconsin at that time) were significantly changed as a result of the national legislation and corresponding USEPA regulations (promulgated in 1980, after much debate). In 1984, Congress

amended RCRA with the Hazardous and Solid Waste Amendments (HSWA), and corresponding U.S.EPA regulations followed soon after. Again, equivalent Wisconsin legislation was passed, primarily related to hazardous waste.

To implement these statutory requirements, the DNR established several administrative code series: NR 51 in 1969, NR 151 in 1971, NR 180 in 1980, and NR 500 originally promulgated in 1988. The NR 500 series was significantly modified in 1996 to incorporate federal MSW landfill requirements (Subtitle D), as well as a number of other substantial changes that occurred over the preceding 8 years.

Among the federal Subtitle D law changes was the requirement for an MSW landfill owner to establish a remedial action account, if their landfill was found to have impacted the environment such that remedial action was required. Corresponding Wisconsin legislation was passed requiring establishment of a remedial action account. Wisconsin legislation mirrored the federal requirement in that the account must be established only if, and when, it is determined that remedial action is necessary. The Wisconsin legislation also prohibits DNR from using closure or post-closure long-term financial responsibility moneys to pay for remedial actions.

In addition to requirements for waste handling and disposal, there are many requirements pertaining to other aspects of waste management, notably related to: recycling, composting, medical and infectious waste, and beneficial reuse of industrial by-products. These issues are discussed in more detail below.

Air and water quality requirements, not described herein, have also significantly impacted waste facilities. For example, air emissions from solid waste landfills and waste combustion operations must comply with air quality standards. Likewise, sewage and surface water discharges from waste facilities must comply with various water quality standards.

It is important to note that on site disposal of solid waste generated from a single family or household is exempt from regulation under solid waste laws. In accordance with s. 289.43(5), Stats., "Exemption from regulation; single-family waste disposal", DNR may not regulate under ch. 289, Stats., any solid waste from a single family or household disposed of on the property where it is generated. This allows Wisconsin residents to dispose on site any solid waste generated on site, including food waste and asbestos from their home, or the entire home, unless prohibited by local ordinance. Only if the disposal causes a hazardous substance discharge, such as groundwater contamination, may DNR require a resident to remediate the discharge under the hazardous substance spill law. While the DNR has the legal authority to require such a remediation, for a variety of reasons it may not be feasible for the DNR to do so. The single-family waste disposal exemption does not prevent DNR from regulating burning of household trash, since burning is a method of waste processing rather than disposal. State air pollution and solid waste laws generally prohibit the use of burn barrels or open burning of most household trash. Exceptions are listed in ss. NR 502.11(2)(d) and 429.04, Wis. Adm. Code, and include the following materials from a single family or household when

burned on the property where generated: lawn and garden debris, and small quantities of dry combustible rubbish such as untreated and unpainted wood, and paper and cardboard that is not recyclable.

## **B. Recycling**

The first legislation related to recycling was enacted in 1974 and resulted in the creation of the Wisconsin Solid Waste Recycling Authority. The Authority was given the responsibility for promoting, implementing and developing large-scale, regional, solid waste recycling facilities. However, the success of the Authority was questioned, resulting in the Authority being terminated by 1983 Wisconsin Act 27.

Additional solid waste recycling and recovery policy was established in 1983. Specifically, legislation established six categories of solid waste management, and listed their order of priority: 1) reduction, 2) reuse, 3) recycling, 4) composting, 5) energy recovery, and 6) land disposal.

Today, recycling is regulated under Chapter 287 of the Wisconsin Statutes. Enacted in 1990, the Recycling Law effectively made recycling a mandatory activity by prohibiting certain materials from being disposed in landfills within the state. Since 1990, the Recycling Law has been the primary “driver” for municipal solid waste recycling programs in Wisconsin. The materials prohibited from landfill disposal (and specified for recycling) were selected based on toxicity or hazard to the environment (oil, lead acid batteries and appliances), ease of home management/potential hazard if landfilled (yard waste), and recyclability as raw material (cardboard, newspaper, magazines, office paper, bottles, cans, and tires). The landfill prohibitions were phased in beginning in 1991 (large appliances referred to as white goods, car batteries, and waste oil), in 1993 (yard waste), and in 1995 (cardboard, aluminum, plastic and steel containers, combination steel and aluminum containers, foam polystyrene packaging, magazines, newspapers, office paper, and tires). The Recycling Law allows yard waste, waste oil, and waste tires to be burned with energy recovery. A Wisconsin community must have an approved recycling program in order to use a Wisconsin landfill for disposal of municipal solid waste generated in that community.

Under the Recycling Law, local governments responsible for implementing recycling programs are referred to as Responsible Units, defined as a city, village, town, county, federally recognized Indian tribe, or any other unit of government. In each locality, local governments decide what level of government is designated as a Responsible Unit. As of 1999, there were 1,070 Responsible Units implementing effective recycling programs in the state, with 34 being counties. This is down slightly from 1,080 Responsible Units in 1998.

The Legislature also provided for two matching grant programs, both administered by DNR. The Municipal and County Recycling Grants program was created as part of the Recycling Law in 1990 to provide financial support to responsible units by reimbursing certain eligible recycling costs (discussed in more detail in a separate appendix). The Waste Reduction and Recycling Demonstration Grants provide financial support to

public and private organizations for waste reduction, reuse and recycling pilot projects involving process improvements and recycled product manufacturing. The Waste Reduction and Recycling Demonstration Grants program was originated in 1986 at \$50,000 per year, was increased to \$1 million per year as of the Recycling Law in 1990, and was reduced to \$500,000 per year in 1999. Since 1990, 143 Waste Reduction and Recycling Demonstration Grants have been granted, totaling just over \$10 million. The Waste Reduction and Recycling Demonstration Grants have provided funding for projects involving all of the solid wastes banned from landfill disposal, as well as other solid wastes, such as household hazardous wastes, construction and demolition wastes, commercial and institutional food wastes, and industrial process wastes.

### **C. Composting**

Until 1996, composting facilities for all types of solid waste were regulated under a general solid waste processing rule (applicable to all types of solid waste processing not specifically regulated elsewhere). In 1996, s. NR 502.12, Wis. Adm. Code became effective for composting yard waste, vegetable food waste, and agricultural wastes. The rule spurred increased development of composting facilities for the targeted wastes by providing more specific information about necessary design and operation, as well as by reducing plan submittal and department review requirements for these facilities. In 1999, the Waste Management Program was authorized to begin rule development on compost quality standards that are expected to apply to composts derived from other waste types, particularly industrial by-products. For several reasons, the department is very interested in developing quality rules for waste derived composts. The rules can be expected to spur further composting development, resulting in additional waste reuse, while also improving regulatory protection and consistency, and reducing department plan review workload. However, the compost quality rule development has been deferred (in favor of other innovative regulatory work), with the earliest possible effective rule date now in mid-2003.

### **D. Tires**

In 1988, the Wisconsin Waste Tire Removal and Recovery Program was initiated. Administered by WDNR, the program was funded by a one-time levy of \$2 per tire for first-time registration of any on-road vehicle in Wisconsin. It was intended to reduce or eliminate the environmental, public health, fire, and nuisance hazards associated with the uncontrolled stockpiling of waste tires and to develop recycling and reuse markets. As noted above, tires were banned from Wisconsin landfills in 1995. By legislative mandate, the tire program expired in June 1997. A summary of tire recycling services and markets, and legislative impacts, are presented below.

### **E. Other Waste Treatment**

A growing awareness of environmental impacts from waste disposal resulted not only in more stringent design and operating requirements for landfills, but also lead to the development of treatment requirements for various types of solid waste. Under the

federal HSWA of 1984, land disposal restrictions were placed on certain hazardous wastes. These restrictions required treatment to reduce the toxicity of hazardous waste, prior to land disposal.

Voluntary treatment of non-hazardous solid waste was also of interest, if the treatment could render the waste harmless such that disposal costs could be reduced. Most solid waste treatment is regulated under chapter NR 502 (Solid Waste Processing) of the NR 500 series. This chapter has undergone a variety of revisions over time, particularly to allow and encourage on-site treatment of wastes, and to develop more detailed regulations based on specific processing methods. The development of specific regulations under chapter NR 502 for yard, food, and agricultural waste composting, discussed in greater detail elsewhere in this appendix, is one example of these revisions.

Under certain circumstances, direct application of waste to the land provides appropriate treatment, as well as potential agronomic benefits. Solid waste landspreading, always considered a form of disposal, and sometimes considered a viable treatment method, is regulated under chapter NR 518. A number of revisions have been made to solid waste landspreading requirements since initial promulgation under the NR 180 series in 1980. Notable recent revisions include: exemptions by rule for landspreading composted yard wastes, availability of written exemptions for landspreading coal ash, and the development of additional location restrictions for non-exempt waste landspreading.

Another important treatment area is infectious waste treatment. In 1992, Wisconsin passed legislation requiring specific handling for medical and infectious waste. Corresponding DNR regulations in chapter NR 526 became effective in 1994. In particular, infectious wastes must be treated prior to disposal. Infectious wastes are wastes that can pass on infectious diseases to susceptible persons or animals. Examples of infectious waste include used sharps (such as a hypodermic needle), and blood or human tissue. Medical waste includes infectious wastes plus any non-infectious wastes that may be mixed with them.

## **F. Beneficial Reuse**

As waste disposal regulations became more stringent, industry had increased incentives to reduce, reuse, and recycle. Changes in raw materials used, processes, and the collection of wastes all played important roles in making it possible to reuse more industrial wastes. Laws passed in the late 1980's, gave DNR broad authority to approve waste reuse on a case by case basis. While increasing quantities of waste were already being approved by DNR for waste reuse projects, the case by case submittal and review process was difficult. In an effort to standardize and increase industrial waste reuse, in 1995, Wisconsin passed additional legislation directing the development of specific reuse options and testing requirements. Correspondingly, DNR developed chapter NR 538, Beneficial Reuse of Industrial By-Products, promulgated in 1997.

Although these rules have been extremely helpful, the need for future policy work in this area has already become apparent. One issue of concern is pollution from persistent, bioaccumulative, and toxic constituents that may be present in the wastes only at very low levels, but that are distributed into the environment in large amounts due to the immense quantities of qualified industrial by-products. This concern is heightened by the fact that industry submittals have increasingly proposed to mix wastes to achieve reduced regulatory status through contaminant dilution. In 2000, DNR top management authorized formation of an internal workgroup to evaluate the impacts from persistent, bioaccumulative, and toxic pollutants and create a strategic plan to guide future policy development in this area.

### **7.1.2. Results of Landfill Diversion Efforts**

#### **A. Reduction and Reuse**

Solid waste reduction and reuse have been practiced for a long time in Wisconsin. Reuse of old clothing, furniture and appliances are a common activity in most communities. In addition, industrial by-product reuse has increased over the last decade as disposal costs have increased and new opportunities, particular for construction uses, have been identified. Businesses in Wisconsin have financial incentive to regularly examine waste reduction and recycling opportunities in order to minimize the costs, especially for high volume wastes and hazardous wastes. Businesses also have marketing incentive to reduce and recycle wastes, as consumers have shown increasing interest in buying more environmentally friendly products and supporting businesses that have a strong environmental ethic.

There has been a steady increase in industrial waste reuse over the past decade. In 1998, 1,004,116 cubic yards (or 1.2 million tons at 2,200 lb/cy) of coal ash and foundry waste was reused. If not for their reuse, these wastes would be disposed in licensed landfills. Additional information about beneficial reuse of industrial by-products is provided below. While there are reporting mechanisms to document certain waste reduction and reuse activities, data on many of these activities is not captured regularly.

In 1997, the Department of Natural Resources undertook an effort to collect comprehensive statewide information on residential and commercial waste reduction and reuse efforts. The study was conducted by Franklin Associates, and the information is compiled in The Franklin Report. It was estimated that the 1993 landfill ban on yard waste resulted in a source reduction of 290,000 tons, primarily due to at-home management. Waste sorts conducted by the City of Milwaukee found similar at-home management results through their "Just Say Mow" campaign to encourage leaving grass clippings on the lawn, reducing grass clippings from 13% of the City's collected waste to under 2%.

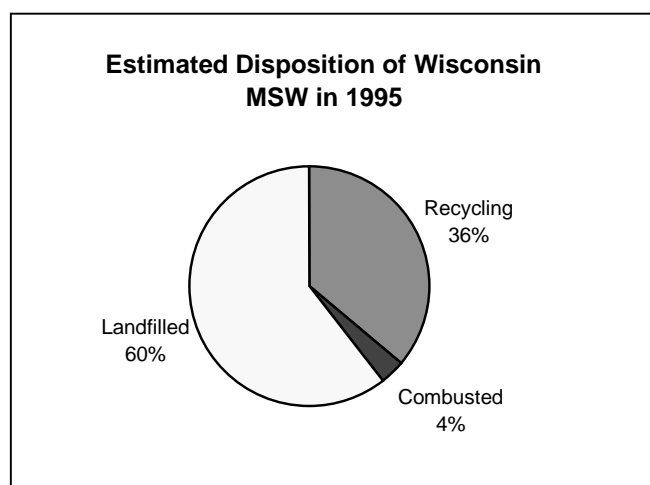
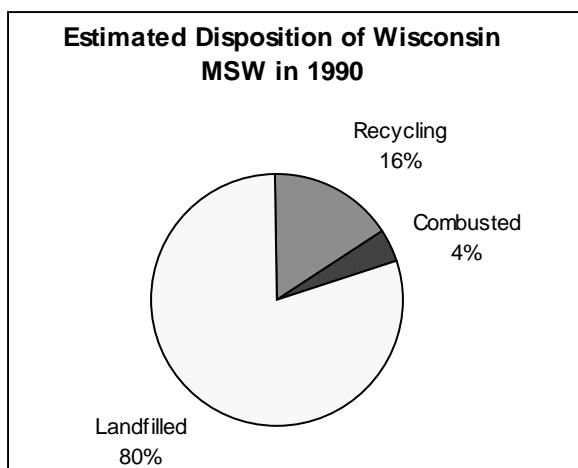
It was concluded that waste reduction efforts have reduced municipal solid waste generation by approximately 5%. The Southeast Wisconsin Waste Reduction Coalition, a group of businesses, local governments, technical assistance providers, and



environmental organizations all striving to implement a multimedia waste reduction effort, has set a 5% reduction as their goal. More research is needed to determine what motivates individuals to practice waste reduction and reuse, and additional information on collection efforts are needed to up-date data on waste reduction and reuse performance in Wisconsin.

## B. Recycling and Composting

The development of local effective recycling programs for the 15 materials banned from landfill disposal resulted in a dramatic increase in the quantities of Wisconsin-generated waste recovered for recycling. Municipal solid waste (MSW) recycling tonnage jumped 129% between 1990 and 1995: from 16% of generation in 1990 to 36% of generation in 1995. Correspondingly, landfilling of MSW decreased as a percentage of waste generation from 80% (in 1990) to 60% (in 1995). Combustion at energy recovery facilities (including mass burn, refuse-derived fuel, and shredded tires) also decreased slightly as a percentage of waste generation (3.9% in 1990, 3.5% in 1995). Used tire combustion increased significantly between 1990 and 1995, indicating a greater decrease in MSW combustion over this period. The tires to energy market peaked in 1996 with nearly 90% of waste tires in Wisconsin used as fuel. Waste diversion from landfill disposal during this period is shown in the charts below. Although combustion with energy recovery meets the Wisconsin definition of recycling, combustion is shown separately from other recycling in the charts.



**Table 7.1.-1. RECYCLABLE MATERIALS COLLECTION REPORTED BY WISCONSIN RESPONSIBLE UNITS (in tons)**

Year banned From disposal	RECYCLABLE MATERIALS	12/31/1994	12/31/1995	12/31/1996	12/31/1997	12/31/1998	12/31/1999
95	ONP	61900	112026	119340	137609	137818	145579
95	OMG	7083	16405	18013	18947	17413	20418
95	OCC	2494	36960	41251	42544	46055	47328
95	Office Paper	2928	2739	3415	8736	2531	3072
95	Mixed ONP/OMG	62501	60434	51554	50230	47995	37227
95	Tires	5025	8827	7007	10329	9002	8693
95	Aluminum Cans	3819	5849	6785	5515	6656	6672
95	Steel Cans	14218	20358	20873	22149	21749	22058
95	Glass Containers	49371	71488	70415	74753	71947	77471
95	Plastic Container	12017	19415	19858	22464	23858	21738
95	Co-mingled Containers	2784	6166	5064	2665	3023	2416
95	PS Foam	99	41	220	297	137	276
95	95 ban materials reported as total	7487	8788	4213	3251	475	3458
90	Appliances	7855	8772	9270	10566	12276	13415
90	Batteries (lead acid)	2035	688	571	567	675	788
90	Used Oil	3103	4311	4000	4446	4707	4353
93	Yard Waste	213635	210288	241492	280197	288595	277666
bans subtotal	<b>Subtotal Tons (banned material only)</b>	<b>458354</b>	<b>593555</b>	<b>623341</b>	<b>695265</b>	<b>694912</b>	<b>692628</b>
non-banned	Scrap Metal					4	9931
non-banned	Used Clothing/textiles					0	580
non-banned	Miscellaneous Recyclables	3195	38185	67119	64529	83434	47410
non-banned	Residential Mixed Paper (MWP)	0	9131	9225	7144	15785	13055
	<b>TOTAL TONS REPORTED</b>	<b>461549</b>	<b>640871</b>	<b>699685</b>	<b>766938</b>	<b>794135</b>	<b>763604</b>

Notes: 1996 used oil figure is an estimate due to errors in data as reported.

1997,1998, 1999 data revised 11/28/00 to include recently submitted annual reports (late submittals).

If Scrap Metal and Used clothing/textiles were collected before 1998/1999, they were included in Miscellaneous category.

### C. Per Capita Generation and Comparison to National Performance

Wisconsin's total MSW recycling in 1995, at 36% of generation, is one-third higher than the 27% recycling estimated nationally for that year. It should be noted that a significant portion of this is due to the recycling of yard waste through composting, and can be credited to the 1993 ban on landfill disposal of yard wastes. Further, the landfill disposal ban on yard waste has resulted in an additional 290,000 tons of waste reduction through home management, meaning that this quantity of yard waste is no longer needed to be collected and thus it does not become part of the MSW generation accounted for. Adding yard waste reduction (through home management) to the amounts collected for recycling results in an overall MSW diversion rate of nearly 41% in 1995.

On a per capita basis, Wisconsin residents and businesses generated less MSW in 1995 than 1990: 3.97 pounds of MSW per person per day in 1995 compared to 4.06 in 1990. This decrease reflects Wisconsin's efforts to "reduce and reuse," especially by managing yard wastes on site and by composting, both at home and at larger facilities. Compared to the nation as a whole, Wisconsin generated less MSW, 3.97 pounds per Wisconsinite compared to 4.41 pounds per US citizen, and recycled more MSW, 1.43 pounds per Wisconsinite compared to 1.15 per US citizen. Although Wisconsin did reverse the trend toward ever-increasing waste generation per person, our 1995 level of MSW generation still represents significant historical increases from 2.68 pounds per person per day nationally in 1960 and 3.25 pounds per person per day nationally in 1970. Additionally, population increases continue to push Wisconsin's total waste generation higher, and current waste reduction and recycling strategies are unable to compensate for these increases.

Each year in Wisconsin, about 5 million waste tires (or about 50,000 tons) are generated. Prior to the 1988 legislative funding initiative some portion of these tires were being disposed in landfills, but many tires were being disposed in piles, large and small, and the number of tire stockpiles across the state continued to grow. In 1988, public health concerns with the tire piles forced the practice of stockpiling to be discontinued. At that time, landfill disposal of tires was legal, and it could have increased dramatically. Instead, a 1988 legislative funding initiative provided incentive to recycle waste tires rather than dispose of them. In 1995, landfill disposal of tires was banned altogether in Wisconsin.

Wisconsin has been a leader in industrial waste reuse, particularly for coal ash. In the mid-1980's, approximately 14 million tons of coal ash were generated annually in the U.S., with only about 20% being beneficially reused ("Solid Waste Management for Utility Reconversions", G. Welshans, Journal of Energy Engineering, Vol. 111, No. 1, September 1985). During the same period, coal ash was being beneficially reused at a rate of about 40% in Wisconsin ("Evaluation of Recycling and Reuse of High Volume Industrial Waste in Wisconsin", DNR Solid Waste Management Section, October 1988). National data is not known on other industrial wastes for comparison to Wisconsin reuse rates. The success of coal ash reuse in Wisconsin can be greatly attributed to a

financially strong and environmentally conscious electric utility sector, as well as to WNDR's open-minded and forward thinking culture, all fostered by an environmentally aware citizenry.

#### **D. Diversion Rates in Terms of Waste Disposal Prevented**

To put landfill diversion rates in terms of waste disposal prevented, landfill space "saved," and disposal cost avoided, every 1 1/2 years that Wisconsin citizens reduce and recycle MSW at 1995 levels (41%), we:

- prevent disposal of 3.5 million cubic yards of waste,
- save the space equivalent to an average sized MSW landfill (4,440,000 cubic yards design capacity), and
- avoid \$48.8 million in landfill disposal costs (in 1995 dollars, assuming a landfill tipping fee of \$30 per ton).

Similarly, about every 4 years, industrial waste recycling and beneficial reuse prevents the need for an average sized landfill.

Wisconsin's MSW waste reduction and recovery rates suggest the amount of landfill capacity being proposed might decrease accordingly. However, this has not been the case (see discussion in Landfill section below).

The implementation of effective recycling programs in response to the disposal bans has stimulated very high recovery rates for most of the common recyclable materials: 80.3% of aluminum beverage cans; 79% of corrugated cardboard containers; 77% of newspapers; 57% of high grade office paper; 54% of magazines; 53% of steel cans; 51% of glass containers; and 47% of plastic containers, mostly PET (#1) and HDPE (#2).

### **7.1.3. Infrastructure, Costs, and Markets**

#### **A. Overview**

While responsibility for implementing an effective recycling program for household recyclables is clearly placed upon local government, no such provision applies to the other components of the solid waste system. However, most local governments do take considerable responsibility for managing other solid wastes generated within their boundaries. In each community solid waste management has evolved in different ways, with a wide variation in the types of services provided and the distribution of services. Table 6.1-2, below, compares key components of solid waste services for three Wisconsin communities. In general, most citizens of the state have access to solid waste disposal and recycling services. However isolated incidences of inadequate coverage of solid waste services has occurred, particularly in more rural areas and where there has been a reduction in the number of smaller hauling companies. There is also inadequate coverage of services for household hazardous waste, medical waste, and tire recycling. Additional information about recycling and disposal services is provided below.

**Table 7.1.-2. Components of Solid Waste Services for Three Wisconsin Communities** (source: Jon Tulman, City of Eau Claire and Steve Brachman, UW-Extension, 1999/2000).

Activity	City of Milwaukee	Outagamie County	City of Eau Claire
Collection	<p>City collects solid waste for disposal, recyclables, and yard waste.</p> <p>Private business under regional contract with sewage district collects household hazardous waste.</p>	<p>Primarily private business under municipal contracts collects solid waste for disposal, recyclables, and yard waste.</p> <p>Some municipalities also provide some collection.</p> <p>County collects household hazardous waste.</p>	<p>Primarily private business under individual household contract collects solid waste for disposal, recyclables, and yard waste, but there is no requirement to subscribe.</p> <p>Solid waste is taken to private transfer stations prior to disposal.</p> <p>Private business under County contract collects recyclables in designated service areas.</p> <p>Individuals may take brush to County sites.</p> <p>Individuals may take household hazardous waste to County clean sweep site (operated with Chippewa County and a private contractor).</p>
Processing	<p>Private business under City contract process recyclables at MRF.</p> <p>Private business under City contract process yard wastes by composting.</p>	<p>County processes recyclables at MRF.</p> <p>County processes yard wastes from Appleton by composting.</p> <p>Private business under contract with other municipalities process yard wastes by composting.</p>	<p>Households may burn leaves and brush.</p> <p>County processes brush by chipping.</p> <p>Private businesses provide recyclable material processing services.</p>
Disposal	Private landfill under City contract.	County landfill.	Private landfill with no City contract, except for leachate collection.

## B. Recycling

Today Wisconsin has a moderately well developed recycling infrastructure for household recyclables, including aluminum and steel cans, glass containers, and certain plastics. There is good availability of collection services, moderate to good availability of intermediate processing facilities, and poor to moderate availability of end use markets (manufacturing) for collected materials. We have over 500 licensed waste haulers and recycling service providers collecting recyclables, 142 “self-certified” material recovery facilities to process materials, and 373 companies listed in the Wisconsin Recycling Markets Directory that buy or accept 137 types of recycled material (1999).

In the early and mid 1990s, the number of these services was generally increasing, but over the past two years, data indicates that the number of services associated with recycling have decreased substantially. For example, in 1997, there were 474 companies listed in the Wisconsin Recycling Markets Directory that would buy or accept 245 types of recycled material. The reduction in the number of recyclables services may be a result of consolidation, and/or a general stabilization of the industry, as in general, a high percentage of new businesses fail. However, the reduced number of material types being bought or accepted indicates a clear trend that the number of materials types considered recyclable in Wisconsin has recently been decreasing.

Many Wisconsin businesses have reduced operating costs and increased sales through waste reduction and recycling. Community recycling programs were expected to save local governments money compared to the cost of landfill tipping fees, and while some have realized savings, in many cases this has not been apparent. Recycling may have other financial benefits to both businesses and local governments, such as reduced long term liability, however figures are not readily available to quantify these benefits.

**Table 7.1.-3. Per Capita Recycling & Yard Waste Program Eligible Expenses.**  
Based on total eligible grant expenses reported to DNR on final payment reports (1999).

RU TYPE	# of RUs	Combined Population for RUs	Combined Eligible Expenses for RUs (\$)	Range of Total Eligible Expenses (\$)	Per Capita Cost (\$)
CITIES	129	2,474,135	\$ 43,047,739	\$ 3,704 - 9,463,800	\$17.40
COUNTIES	34	1,276,958	\$ 13,522,990	\$ 64,325 - 3,178,673	\$10.59
INDIAN TRIBES	9	19,639	\$ 732,971	\$ 4,482 - 156,631	\$37.32
TOWNS	644	976,099	\$ 9,284,190	\$ 527 - 332,484	\$9.69
VILLAGES	240	507,457	\$ 9,456,491	\$ 600 - 632,019	\$18.29
OTHERS	12	40,075	\$ 314,352	\$ 4,143 - 106,886	\$7.84
TOTALS	1068	5,294,363	\$ 76,358,733	\$ 527 - 9,463,800	\$14.42

Our successes have been achieved by forming strong working relationships among local and state governments and with the private sector. In 1999, local government Responsible Units reported their grant eligible recycling and yard waste cost (net of revenues and excluding any oil, battery and appliance recycling costs) at \$76.4 million. The statewide average cost was \$14.40 per capita. Public support for recycling is strong throughout the state. Every citizen in Wisconsin has access to a local recycling program, and 97% of our households participate in recycling activities. Surveys indicate over 80% of Wisconsin residents are committed to recycling and feel that recycling is worthwhile. However, even casual observers regularly encounter businesses and public events lacking basic facilities for recycling. Under-realized savings for local governments and under-participation by businesses and public event planners is believed to be primarily due to inadequate end markets for recyclable materials. There is also a sense among solid waste management professionals that additional technical assistance, monitoring, and enforcement, when necessary, are needed to maintain and improve the efficiency of recycling programs in Wisconsin.

The Recycling Law enacted in 1990 focused on particularly problematic materials (oil, batteries and large appliances), large volume components of residential/business waste (yard waste, corrugated cardboard, newspaper, magazines, and office paper) and readily recycled materials (tires and food/beverage containers). Some major components of MSW, such as mixed waste paper (estimated generation of 592,000 tons per year in Wisconsin) were not included in the recycling law due to concerns about wide fluctuations in market demand. Other major components, such as food waste (estimated generation of 406,000 tons per year in Wisconsin) required very different collection and processing systems than most other recyclables, and appropriate systems were not yet developed. These materials represent the “next frontier” in recycling, and are already being tackled by certain individuals and organizations with strong environmental ethics and where synergies may exist.

### **C. Composting**

Composting is Wisconsin’s most popular method of managing yard wastes. In 1998, there were 121 licensed yard waste composting facilities. (This does not include composting facilities for other solid wastes, such as food or agricultural wastes, even though some of these facilities may also accept yard waste.) Wisconsin’s yard waste composting facilities are almost exclusively open outdoor windrow operations, although silage bags fitted with forced aeration pipes and blowers have also been used. Yard waste compost is most commonly provided free to local residents, and in some cases, is sold in bulk to landscaping businesses. Well-operated facilities produce good quality compost and most often find that local demand outstrips production. However, facilities producing poor quality compost have to continually seek out customers and may have to cover transportation costs.

On a household level, backyard composting is becoming much more commonplace. Indicators of growth include the increasing popularity of municipally sponsored compost bin sales and a burgeoning corps of Master Composter outreach volunteers. The potential for diversion of organic materials such as yard trimmings and food scraps at a household level is sizable if more households begin composting and managing their organic materials at home.

This growth in composting activity has resulted in an accompanying demand for information and education. For the past seven years, an annual composting conference has been held to provide private and public sector attendees with current information on composting practices and research. Other recent educational programs in Wisconsin have included compost marketing workshops, compost use field days, and booths at Farm Progress days and the Midwest Renewable Energy Fair.

The future of composting as a waste diversion tool appears to be very promising, particularly if sufficient resources are devoted to education, technical assistance and information dissemination. Producers of organic materials are finding that the economics of composting can compete favorably with other waste management alternatives. They can also reap the benefits of finished compost (as a replacement or supplemental soil amendment) or they can market their product to earn revenue.

While home composting and municipal and commercial yard waste composting has increased very rapidly over the past decade, composting of other solid wastes has increased at a slower, but steady rate. However, in 1996, Wisconsin composting rules, s. NR 502.12, Adm. Code, became effective and spurred a somewhat greater rate of solid waste composting facility development.

Between 1986 and 1999, seven composting facilities have been approved to accept waste streams including mixed municipal solid waste, fruit and vegetable food processing waste, animal manure, and food waste from grocery stores and cafeterias. Over half of these facilities were developed since 1995. In general, yard waste and clean chipped wood is also mixed in the composting process. Other materials, such as lake weeds, are also accepted at some facilities. The combined capacity of the seven approved facilities is about 65,000 tons per year of solid waste.

In addition, small composting facilities operating with less than 50 cubic yards of material on site at any time are exempt from DNR licensing. Because these small facilities are exempt from licensing, the actual number of these facilities and the amount of material they accept is unknown. We estimate that about a dozen of these small facilities exist, located at or near cafeterias and restaurants they are designed to serve, and that collectively, these facilities process about 1200 tons/year of solid waste.

There are also a number of farm composting operations which are exempt from licensing. Again, it is unknown how many of these unlicensed facilities there are, and since facility size is not part of the exemption criteria, DNR is unable to provide any meaningful estimate of the amount of material processed by these facilities.

Even since the landfill ban on yard wastes, more organic wastes are still disposed in landfills than any other single waste type. Perhaps all organic solid wastes could be composted to produce soil products, but there are other important potential uses for organic wastes. In a recent report, the US Energy Administration identified solid waste organics as having a potential role in an expanded ethanol industry in the US.

#### **D. Biopile Treatment**

Between 1994 and 1999, nineteen facilities referred to as biopiles have been approved to accept petroleum contaminated soil. In general, these facilities also use other wastes, such as wood chips and manure, to improve the remediation process. At least two papermill sludge composting pilot facilities have also been approved, and applicants have expressed interest in composting rendering wastes, other industrial process wastes, and PCB contaminated soils, both for treatment and dilution of contaminants.

Wisconsin's composting facilities use a variety of operating systems, including slow turning digesters, periodically turned windrows, and forced aeration piles. The compost produced also varies widely in quality and end use. Some composts are applied in bulk to agricultural and silvacultural land, while other composts are bagged and sold at retail outlets. Biopile processed soil mixtures are commonly used in landfill operations for



daily cover, fill and berm construction. Several composting projects have received DNR Solid Waste Reduction and Recycling Demonstration Grants.

Primary environmental concerns regarding composting include the potential for: odor and methane generation, vectors, surface and groundwater impacts at the facility, and elevated levels of heavy metals, soluble salts, and pathogens, as well as sharps, in the compost produced. These concerns can be addressed through proper facility design and operation, in conjunction with proper selection, monitoring and mixing of incoming wastes.

## **E. Medical and Infectious Waste**

Within Wisconsin, there is little competition among medical and infectious waste transportation services, and basically no competition among treatment services. This is attributed primarily to the fact that medical and infectious waste services are very specialized. There are less than a dozen commercial medical and infectious waste transporters in Wisconsin, and only two off-site treatment facilities. One of the off-site treatment facilities serves non-profit generators only. Distribution of commercial medical waste services in Wisconsin is generally according to population. Some hospitals treat their own wastes on-site: five hospitals in Wisconsin have on-site incinerators, and several other hospitals have on-site non-incinerator treatment units.

There is also a lack of sharps collection (both human and animal) and a lack of outreach and technical support to encourage medical waste reduction efforts. Individual citizens may find sharps drop-off services available through their pharmacies, clinics, and hospitals, for disposal hypodermic needles used by humans. However, there is no requirement for health care businesses to provide sharps drop-off services, and many do not do so. Drop-off services for sharps used for animals are similarly uncertain. In addition, there is insufficient low or no cost technical support available to help health care businesses identify waste reduction opportunities. Considering all of these issues, the medical and infectious waste treatment infrastructure in Wisconsin can be characterized as underdeveloped.

## **F. Beneficial Reuse of Industrial By-Products**

In 1998, 1,004,116 cubic yards (or 1.2 million tons at 2,200 lb/cy) of coal ash and foundry waste was disposed through re-use under ch. NR 538 self-implementing and ch. NR 500 individual exemptions. This represents 44% of the coal ash and foundry waste generated in Wisconsin. Coal ash reuse in Wisconsin has been relatively common for some time, with 1987 rates estimated at 40%, but historically, the reuse of other industrial wastes was much less. There has been a steady increase in waste re-use over the past several years. This is waste that was primarily disposed in licensed landfills a decade ago. Many benefits of waste re-use are obvious, but potential environmental impacts must also continue to be evaluated. For example, for each pollutant present at only an average concentration of 1 part per million, this waste reuse corresponds to 1.2 tons of the pollutant disposed in an unregulated manner.

Notes:

1. Coal ash includes bottom ash and fly ash. Foundry waste includes system sand and slag.
2. The quantity of high volume waste reported as available for use includes all coal ash and foundry waste generated in Wisconsin, without regard for potential pollutants that may limit use.
3. Values do not include all high volume industrial waste used at landfills as daily cover or as fill for construction of internal berms. The total quantity reported as beneficially used at landfills is 550,000 tons (or 367,000 cy at 3,000 lb/cy), an undetermined amount of which is included in the ch. NR 538 reported values.
4. Values do not include any papermill sludge used for heat recovery or landspreading. Minergy Corporation operations in Neenah reported that 225,000 tons (or 205,000 cy at 2,200 lb/cy) of papermill sludge were accepted for combustion to produce steam. The quantity of papermill sludge landspread is available from the Bureau of Watershed Management.

Data Source: "Beneficial Use of Industrial Byproducts 1998 Usage Summary", WDNR.

## **G. MSW Combustors and Refuse Derived Fuel**

Burning municipal solid waste to recover energy in the form of steam heat or electricity showed great promise in the 1970's. A number of plants were built using both mass burn (Muscoda, ARR, Barron County) and refuse derived fuel (RDF) (Madison, Americology, Northern States Power) technology. However, problems with waste handling technology, meeting environmental regulations, public perception and ultimately, unfavorable economics have led to the closure of all facilities except Barron County and Northern States Power. No new waste to energy facilities have been built in Wisconsin in over ten years.

## **H. Tires**

Tire recycling services and markets grew quickly in response to the 1988 legislative funding initiative. However, since the tire program expired in 1997, services and markets have been reduced significantly, and the current distribution of tire recycling services in Wisconsin is poor. In 1999, Wisconsin had only two facilities processing used tires for recycling and two facilities using processed used tires. The only current means of used tire utilization is combustion with energy recovery. There is concern the remaining used tire market in Wisconsin may collapse entirely. If this occurs, the distribution of services can be expected to further decline and tire disposal costs can be expected to increase substantially.

The Wisconsin tire to energy market peaked in 1996 with nearly 90% of waste tires used as fuel, while the U.S. average at that time was estimated at just over 50%. The conventional way of using waste tires as fuel is direct burning (of chopped rubber), usually as a supplemental fuel source in conjunction other solid fuel (coal). It has been found that removing the steel belts creates a much more desirable fuel. However, removing the steel belts is a complex and expensive process that has added significantly to the processing costs and further driven-up tire disposal costs.

It has been known for sometime that tires can be recycled to produce carbon black, along with steel and oil, but until fairly recently, an economical technology to do this had not been proven. Waste tires can also be used to make new molded rubber products, although conventional rubber molding equipment must be converted to use rubber from processed tires. Today, these recycling methods are mostly used internationally, due to market factors. It is unlikely that Wisconsin will have access to tire recycling for materials recovery within the foreseeable future, unless there is a new legislative initiative tied to recycling waste tires for materials recovery.

## **I. Non-Hazardous Solid Waste Landfills**

Awareness of detrimental impacts to public health and the environment from landfills lead to the development of Wisconsin's Solid Waste Management Program in the early 1970's. At that time, the department identified approximately 2,000 landfills operating in the state. The vast majority of these landfills were very small and owned primarily by local governments. The worst were promptly ordered to close, and as of 1976, approximately 1300 landfills remained in operation. Subsequent events that significantly reduced the number of operating landfills included: completion of the U.S. EPA Open Dump Inventory in 1980, passage of the state's comprehensive groundwater law in 1984, and promulgation of U.S. EPA's Subtitle D municipal solid waste (MSW) landfill requirements in 1991 (applicable to operating and proposed MSW landfills of all sizes).

Since the inception of the Solid Waste Management Program, increasingly stringent requirements have been developed for landfill design, construction, operation, monitoring, closure, and long-term care. These requirements have significantly controlled the adverse impacts to public health and the environment, and have likely also played a major role in the phenomenon of larger, but fewer, operating landfills. As of 1992, 56 MSW and 61 non-MSW landfills were operating. Five years later in 1997, the numbers had dropped to 46 MSW and 47 non-MSW landfills.

Total landfilled tonnage (including municipal and industrial wastes) continues to increase in Wisconsin. In 1983, the first year records are available, 6.5 million tons of waste were landfilled in Wisconsin. In 1992, this amount had increased to 7.7 million tons (including approximately 220,000 tons reported as exempt from environmental fees). In the early 1990's, legislation was passed exempting certain waste from environmental fees provided that the department had approved use of the waste at a particular landfill as alternate daily cover material or one of several other potential applications. In 1997, 10.1 million tons were landfilled (including approximately 1.35 million tons reported as exempt from environmental fees).

In 1992, the portion of Wisconsin landfill solid waste tonnage generated in other states was approximately 350,000 tons, less than 5% of all waste being landfilled annually in Wisconsin. However, out-of-state waste landfilled in Wisconsin grew quickly to 1.2 million tons by 1997, and has continued to increase, though more slowly, through 1999. The majority of out-of-state waste originates in Illinois, with Minnesota running a distant second. Far smaller tonnages are received from Iowa, Michigan and Indiana. Solid

waste exported from Wisconsin to other states for landfill disposal is estimated at 162,000 to 199,000 tons (1998). The great imbalance of solid waste imports into Wisconsin is reversed for hazardous waste (discussed further below).

**Table 7.1.-4. Landfill Tonnages** (millions of tons). Based on tonnages disposed reported by landfill operators to DNR.

	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99
WI MSW	4	3.9	4.2	3.9	3.8	3.3	3.7	3.9	3.8	4
Out-of State MSW & non-MSW				0.4	0.5	0.3	0.6	1.2	1.2	1.4
WI non-MSW	3.30	3.7	3.4	3.6	4.2	4.1	5.1	4.9	5.4	4.7
<b>Totals</b>	<b>7.3</b>	<b>7.6</b>	<b>7.6</b>	<b>7.9</b>	<b>8.5</b>	<b>7.7</b>	<b>9.4</b>	<b>10</b>	<b>10.4</b>	<b>10.1</b>

**Table 7.1.-5. Solid Waste Disposal Fees of Neighboring States.** All facilities listed are large landfills.

**ILLINOIS FACILITIES (\$43.65/ton average)**

<b><u>Facility Name</u></b>	<b><u>County</u></b>	<b><u>High Cost (\$/ton)</u></b>	<b><u>Prevalent Cost (\$/ton)</u></b>	<b><u>Low Cost \$/ton</u></b>	<b><u>Date</u></b>
CID-RDF #3 - Waste Mgmt of IL	Cook	100.00	80.00	80.00	May '99
River Bend Prairie - Land & Lakes Co	Cook	100.00	80.00	75.00	May '99
DeKalb County LF - Waste Mgmt of IL	DeKalb	68.00	34.00	34.00	May '99
Settler's Hill RDF- Waste Mgmt of IL	Kane	152.00	38.00	38.00	May '99
Woodland RDF - Waste Mgmt of IL	Kane	150.00	38.00	38.00	May '99
Country Side Landfill - USA Waste Services	Lake	68.00	34.00	34.00	May '99
Lee County LF - Allied Waste	Lee	40.00	24.50	24.50	May '99
BFI - Quad Cities LF - Milan IL	Rock Island	40.00	35.00	32.00	Mar '99
Upper Rock Island LF - Allied Waste	Rock Island	40.00	25.00	25.00	May '99
Winnebago Reclamation Service	Winnebago	58.00	48.00	45.00	Mar '99

**MICHIGAN FACILITIES (\$62.60/ton average)**

<b><u>Facility Name</u></b>	<b><u>High Cost (\$/ton)</u></b>	<b><u>Prevalent Cost (\$/ton)</u></b>	<b><u>Low Cost \$/ton</u></b>	<b><u>Date</u></b>
Blue Crossing LF - Blue Crossing MI	63.00	63.00	60.00	
K & W Landfill - Greenland MI	60.00	60.00		
Michigan Environs -Menomomie MI	67.00	65.00	55.00	Mar '99
United Waste Systems -Ontangon MI	67.00	65.00	55.00	Mar '99
Wood Island (Munsing MI)	60.00	60.00	55.00	

**Table 7.1.-6. Wisconsin Disposal Fees.** Data collected by DNR, *Solid Waste Disposal Fee Project*, 1999.

**WI average \$38.19/ton**

Region	Facility Name	Activity	High Cost \$/Ton	Prevalent Cost \$/Ton	Low Cost \$/Ton	Year	'99 Tonnage
NE	BROWN CNTY. EAST LF.	LF-LARGE	20.62	20.62		'99	161,336
NE	DOOR CNTY. SANITARY LF.	LF-LARGE	38.00	38.00		'99	17,277
NE	KEWAUNEE CNTY. SW BALEFILL	LF-LARGE	33.00	33.00		'99	11,638
NE	MAR-OCO LF.	LF-LARGE	36.00	36.00		'99	16,791
NE	OUTAGAMIE CNTY. SW DIV. LF.	LF-LARGE	26.50	16.50	16.50	'99	167,189
NE	SHAWANO CNTY. PHASE 2 LF.	LF-LARGE	45.00	45.00			13,865
NE	W M W I - RIDGEVIEW RECYCLING	LF-LARGE	29.00	28.76	26.50		241,974
NE	W M W I - VALLEY TRAIL	LF-LARGE	29.10	29.10		'98	239,846
NE	WASHINGTON ISLAND LF.	LF-SMALL		Only waste from the Island			25
NE	WINNEBAGO CNTY. SUNNYVIEW LF	LF-LARGE	18.50	18.50		'98	194,655
NO	ANTIGO CNTY. LF. ***	LF-MEDIUM	80.00	80.00			2,268
NO	ASHLAND CNTY. LF. ***	LF-MEDIUM	46.00	46.00			2,585
NO	BARRON CNTY. INCINERATOR	COMBSTR	42.00	34.00	34.00		
NO	BFI WASTE SYSTEMS OF NORTH AMERICA	LF-LARGE	39.86	39.86	35.00		93,341
NO	HIGHWAY G SANITARY LF.	LF-MEDIUM	56.00	56.00			8,025
NO	LINCOLN CNTY. SANITARY LF.	LF-LARGE	55.00	50.00		'99	14,246
NO	ONEIDA CNTY.	LF-LARGE	45.00	45.00			19,749
NO	SANITARY NORTHWOODS REFUSE DISP.	LF-LARGE	39.00	32.00	28.00		7,471
NO	SUPERIOR CNTY. MOCASSIN MIKE	LF-LARGE	50.00	42.00	39.00		70,726
NO	W M W I - TIMBERLINE TRAIL RDF	LF-LARGE	32.00	32.00			224,580
SC	COLUMBIA CNTY. PROCESSING FACILITY	PROCESS	52.00	33.00	33.00		
SC	DANE CNTY. LF. #2 RODEFELD	LF-LARGE	36.00	36.00	32.00	'98	83,448
SC	DEER TRACK PARK INC. (USA Waste)	LF-LARGE	46.68	36.00	23.00	'98	229,762
SC	GREEN CNTY. LF.	LF-LARGE	27.00	27.00	25.00		15,260
SC	RICHLAND CENTER CNTY. LF.	LF-MEDIUM		Not operating			0
SC	ROCK CNTY./JANESVILLE CNTY.	LF-LARGE	21.50	21.50	17.00	'98	124,704
SC	SAUK CNTY. SANITARY LF.	LF-LARGE	40.00	40.00	33.00	'98	24,286
SC	SUPERIOR GLACIER RIDGE LF.	LF-LARGE	32.31	29.70	27.00		254,032
SC	SUPERIOR VALLEY MEADOWS LF.	LF-LARGE	38.50	38.50	32.00		89,780
SE	KESTREL HAWK PARK LF.	LF-LARGE	42.30	40.00	38.00	'99	115,905
SE	MALLARD RIDGE LF.	LF-LARGE	26.78	26.78	25.00	'98	264,141
SE	SUPERIOR EMERALD PARK INC.	LF-LARGE	41.40	32.00	26.78		473,417
SE	W M W I - METRO RECYCLING & DISP.	LF-LARGE	37.86	34.00	27.30		377,593
SE	W M W I - ORCHARD RIDGE RDF	LF-LARGE	42.50	37.75	36.11		283,127
SE	W M W I - PHEASANT RUN RDF	LF-LARGE	42.48	36.11			771,774
WC	ABBOTSFORD CNTY. LF.	LF-SMALL	58.34	58.34		'98	420
WC	ADAMS CNTY. LF.	LF-LARGE	43.00	43.00			6,272
WC	JACKSON CNTY. SANITARY LF.	LF-LARGE	43.00	43.00		'98	15,119
WC	JUNEAU CNTY. LF. #2	LF-MEDIUM	38.00	38.00		'98	6,383
WC	LA CROSSE CNTY.	LF-LARGE	60.00	60.00		'99	34,689
WC	MARATHON CNTY. LF. AREA	LF-LARGE	38.00	38.00		'99	93,535
WC	MONROE CNTY. RIDGEVILLE SITE	LF-LARGE	30.00	30.00		'98	
WC	NSP-LaCrosse Cnty. MSW COMBUSTOR	COMBSTR	55.00	55.00		'98	
WC	PORTAGE CNTY. LF.	LF-LARGE	42.00	42.00			30,360
WC	SUPERIOR CRANBERRY CREEK (Tork)	LF-LARGE	37.50	37.50		'98	127,344
WC	SUPERIOR SEVEN MILE CREEK LF.	LF-LARGE	39.00	32.88	28.00		124,627
WC	VERNON CNTY. SW/RECYCLING	LF-MEDIUM	50.00	50.00		'98	8,042

During the 1990's, the average size of proposed new landfills or proposed expansions to existing landfills has increased significantly. Previously, the largest landfill proposals were for design capacities of several million cubic yards. However, in the past 5 years, proposals have averaged over 4 million cubic yards in size, with several exceeding 10 million cubic yards. Another continuing trend is the increasing amount of waste disposed of at privately owned MSW landfills versus publicly owned MSW landfills. In 1992, 66% of the waste disposed of at MSW landfills went to privately owned facilities. In 1997, this amount had increased to 80%.

On a statewide basis, MSW landfill disposal capacity fluctuates considerably from year to year, due to the cyclical nature of new landfills being constructed and full landfills closing. However, strong trends have not been demonstrated. Since 1992, MSW landfill remaining capacity has ranged from 48 to 62 million cubic yards and currently resides at 57 million cubic yards. Remaining disposal capacity figures for industrial landfills from 1992 to present appear to show a declining trend with a high of 42 million cubic yards reported in 1992 and a low of 35 million cubic yards in 1997. This is believed to be primarily due to Wisconsin's industrial waste generators' increasing reliance on beneficial reuse applications.

**Table 7.1.-7. MSW Landfill Capacity.** Based on capacity reported by MSW landfill owners to DNR. Sort is by DNR Region, then by facility/operation name.

Facility Name	DNR Region	Capacity as of Jan. '99 (cyds)	Capacity Added in '99	Capacity as of Jan. '00 (cyds)
BROWN CNTY. EAST LF.	NE	957,216		652,397
DOOR CNTY. SANITARY LF.	NE	18,377		4,756
KEWAUNEE CNTY. SW BALEFILL & COMPOST	NE	249,012		224,179
MAR-OCO LF.	NE	1,047,524		1,018,792
OUTAGAMIE CNTY. SW DIVISION LF.	NE	1,350,950		1,006,872
SHAWANO CTY. PHASE 2 LF.	NE	59,209		29,687
W M W I - RIDGEVIEW RECYCLING & DISP.	NE	808,100	4,770,000	5,062,000
W M W I - VALLEY TRAIL	NE	3,796,260		3,452,710
WASHINGTON ISLAND LF./COMPOST SITE	NE	802		786
WINNEBAGO CNTY. SUNNYVIEW LF. SITE	NE	4,686,575		4,363,805
ANTIGO CTY. LF.	NO	17,520		13,874
ASHLAND CTY. LF.	NO	10,361		4,466
BFI WASTE SYSTEMS OF NORTH AMERICA INC.	NO	4,053,040		3,711,215
HIGHWAY G SANITARY LF.	NO	157,465		146,277
LINCOLN CNTY. SANITARY LF.	NO	577,716		547,135
ONEIDA CNTY. LF.	NO	131,381		96,000
SANITARY NORTHWOODS REFUSE DISP.	NO	310,968		286,794
SUPERIOR CTY. OF MOCASSIN MIKE LF.	NO	138,490		74,197
SUPERIOR HICKORY MEADOWS LF.	NO	7,546,000		7,364,470
W M W I - TIMBERLINE TRAIL RDF	NO	1,847,860		1,390,556
DANE CNTY. LF. #2 RODEFELD	SC	2,580,870		2,397,412
DEER TRACK PARK INC.	SC	886,943	9,700,000	10,035,696
GREEN CNTY. LF.	SC	107,000		95,855
RICHLAND CENTER CTY. LF.	SC	177,336		
ROCK CNTY. - JANESVILLE CTY. LF.	SC	1,550,000		1,222,000

SAUK CNTY. SANITARY LF.	SC	533,138		464,924
SUPERIOR GLACIER RIDGE LF.	SC	2,912,070		2,447,609
SUPERIOR VALLEY MEADOWS LF.	SC	19,776		0
KESTREL HAWK Recycle & Disposal Facility	SE	7,021,983		6,471,405
MALLARD RIDGE LF. (Republic Services)	SE	2,975,800		2,711,618
SUPERIOR EMERALD PARK INC.	SE	939,084		9,883,728
W M W I - METRO RECYCLING & DISP.	SE	7,781,000		7,009,000
W M W I - ORCHARD RIDGE RECYCLING & DISP.	SE	6,290,442		5,407,539
W M W I - PHEASANT RUN RDF	SE	1,411,700	2,000,000	2,287,549
ABBOTSFORD CTY. LF.	WC	6,825		5,675
ADAMS CNTY. LF. & RECYCLING CENTER	WC	438,136		423,672
JACKSON CNTY. SANITARY LF. INC.	WC	47,130		6,901
JUNEAU CNTY. LF. #2	WC	213,598		204,468
LA CROSSE CNTY.	WC	1,232,345		1,163,649
MARATHON CNTY. LANDFILL AREA B	WC	1,477,300		1,296,500
MONROE CNTY. RIDGEVILLE SITE & DEMO LF	WC	145,560		103,220
PORTAGE CNTY. LF.	WC	231,632		158,846
SUPERIOR CRANBERRY CREEK	WC	1,200,000		926,379
SUPERIOR SEVEN MILE CREEK LF. INC.-SEC 2	WC	1,782,464		1,506,900
VERNON CNTY. SOLID WASTE/RECYCLING	WC	202,494		188,222
<b>Totals</b>		69,929,452	16,470,000	85,869,735

Current landfill design requirements include thick, low-permeability clay or composite liners and final cover systems, efficient leachate collection systems, and landfill gas collection and treatment for sites containing gas-producing wastes. As previously mentioned, stringent requirements also exist for landfill construction, operation, monitoring, closure, and long-term care. These requirements have proven to be protective of the environment over the two decades or so that they have been in existence. However, the associated costs are believed to have led to increasing cases of illegal disposal of solid waste, particularly in rural areas where significant travel may be required to reach an operating landfill.

A landfill owner is currently required to provide proof of financial responsibility for landfill closure and a 40 year post-closure long-term care period. However, some landfills in the state that have been closed for 40 years or more are still producing gas and leachate, and it is apparent that a 40 year long-term care period is insufficient. A landfill owner is also required to establish a remedial action account, but only if, and when, their landfill is found to have caused an environmental problem that must be remediated. This has proven problematic in cases where landfill owners have been unwilling or unable to provide the money, and the state has instead had to finance remedial actions.

The design standards to keep precipitation out of the waste have been important to limit environmental emission rates to controllable levels. In recent years, the design standards have also been criticized for entombing waste and merely delaying problems. Discussions between landfill owners, academia, and the department have led to the development of pilot projects to increase waste degradation rates within landfills, primarily by increasing the moisture content of the waste in a controlled manner. This design and operation, sometimes referred to as bioreactor landfill, has several potential benefits as well as possible drawbacks.

Landfill owners may view bioreactor landfill technology as an opportunity to make their businesses more profitable, through increased waste disposal and potential savings on leachate treatment. Others may also view bioreactor technology favorably, as an opportunity to reduce the need for new landfills and perhaps prevent future increases in tipping fees. Another potential benefit is the ability to more quickly generate and use the methane gas produced. Bioreactor operation may also reduce long term liabilities associated with landfills.

However, a landfill is not a very easy place to maintain a controlled a process. Gas and leachate collection systems may need higher capacities. Wet waste is heavy and slippery, and the waste can landslide and cause catastrophic failure of the flexible geomembrane liner component. Concern over these problems increase with landfill size. Other concerns with bioreactor landfills include leachate leakage overtime through small holes in the liner caused by damage, improper installation, and manufacturing imperfections. There are also issues regarding landfill life, both in terms of how long local governments and neighbors are willing to have a landfill operate, and in terms of how the bioreactor operation may affect the useful life of critical landfill components.

Finally, it is important to note that many landfilled solid wastes are not biodegradable, and many landfilled wastes also contain persistent, bioaccumulative, and toxic (PBT) substances. Operation of a landfill as a bioreactor would tend to make certain PBT substances more soluble, and at the same time may concentrate PBT substances. In the long run, PBT substances need to be eliminated to the greatest extent possible in products and manufacturing wastes. However, for now, those wastes must be disposed, and stable disposal facilities are needed to contain them. One way this issue could be resolved is to have some bioreactor landfills that would be dedicated for very low hazard readily biodegradable wastes, while dedicating other landfills to the non-biodegradable wastes that contain PBT substances.

The bioreactor landfill and the issues associated with it are being evaluated, and it is not yet known how the technology can best be utilized. However, this technology is likely to play a primary role in the future development of organic solid waste management practices, particularly landfill operation, over the next decade.

Many industrial wastes (PCBs, dioxin, radioactive wastes) which have the potential to threaten human health and the environment do not fall or are exempt under the hazardous waste or other regulations and are being managed in municipal landfills.

## **J. Incineration**

A number of local governments (the cities of Sheboygan, Elbert Lake, Green Bay, Port Washington, and Waukesha) and hundreds of hospitals historically practiced incineration of waste without energy recovery. However, by 1990, promulgation of stricter air management and ash disposal regulations closed all older incinerators. Unfavorable economics and a lack of public acceptance have limited incinerator use to two counties (LaCrosse and Barron, both with energy recovery) and a handful of hospitals (Beloit, Prairie du Chien, and Madison Veterans' Administration Hospital).



In many areas of Wisconsin, both urban and rural, burning of waste in barrels and in open piles is a common practice. In recent years, the Department of Natural Resources has been receiving an increasing number of complaints from rural residents about neighbors burning trash, especially illegally burned items such as plastics and mixed household trash. Statewide, one out of every two out-of-control wildfires is started by debris burning. What many people don't realize is that this practice can be as damaging to our health and environment as the emissions coming from industrial sources.

Smoke from burning farm and household waste is unhealthy to breathe. Small children, pregnant women, older adults and people with asthma or other respiratory ailments are especially sensitive to its effects.

- ✓ Smoke from burning of these materials can contain hydrochloric acid as well as formaldehyde and other aldehydes. These chemicals are especially irritating to the eyes and lungs.
- ✓ Bleached paper products, lightweight white cardboard, and certain plastics contain chlorine which create dioxins when burned with other trash at low temperatures. Exposure to dioxins is associated with cancer, birth defects and altered immune function.
- ✓ Burning slick colored papers and cardboard printed with synthetic inks releases heavy metals into the atmosphere. The absorption of heavy metals by humans has been linked to birth defects and cancer.
- ✓ The burning of polystyrene polymers - such as foam cups, meat trays, egg containers, yogurt and deli containers - releases styrene. Styrene gas can readily be absorbed through the skin and lungs. At high levels styrene vapor can damage the eyes and mucous membranes. Long term exposure to styrene can affect the central nervous system, causing headaches, fatigue, weakness, and depression.

Burning of waste is also harmful to the environment. Pollutants released from burning waste in a burn barrel are transported through the air either short or long distances, and are then deposited onto land or into bodies of water. A few of these pollutants such as mercury, polychlorinated biphenyls (PCBs), dioxins and furans persist for long periods of time in the environment and have a tendency to bioaccumulate which means they build up in predators at the top of the food web. Bioaccumulation of pollutants usually occurs indirectly through contaminated water and food rather than breathing the contaminated air directly. In wildlife, the range of effects associated with these pollutants includes cancer, deformed offspring, reproductive failure, immune diseases and subtle neuro-behavioral effects. Humans can be exposed indirectly just like wildlife, especially through consumption of contaminated fish.

Recent studies by EPA and others have found that, collectively, burn barrels are a major contributor of dioxin and furan emissions in the Great Lakes Basin.

A recent study conducted by the United States Environmental Protection Agency (USEPA) and the New York State Department of Health compared emission results from open burning versus a controlled MWC (municipal waste combustor). The report concludes that under the conditions studied, and when using comparable weights of trash, emissions from open burning are significantly higher than for controlled combustion in a modern, clean-operating MWC (municipal waste combustor). In fact, only a small number of households (2 to 40) using burn barrels emit as much dioxin and furans as a municipal solid waste incinerator burning 200 tons of waste per day.

Trash burning also causes odor problems. Smoke released from burning waste is released close to the ground and may drift onto a neighbor's property. DNR staff are being notified more and more frequently of situations where neighbors are concerned about odors coming from the pile burning next door.

State air pollution and solid waste laws generally prohibit the use of burn barrels or open burning of most household trash, with the exception of certain dry clean materials. Burning any of the following materials under any conditions is prohibited:

- Wet, combustible garbage, such as wet cardboard or paper
- Oily substances, such as oily or greasy rags, oil filters, etc.
- Asphalt, such as asphalt singles or tar paper
- Plastics of any kind, including plastic bottles and plastic bags
- Rubber products, including tires and hoses

These prohibitions apply to individual home owners (or renters), as well as to businesses and governments. Local ordinances may further prohibit outdoor burning.

In addition, State Forestry/Fire Control regulations may require a burning permit be obtained prior to burning of ANY material during certain times of the year. It is important to check with the local fire authority and State Fire Control prior to starting any fire.

## **ALTERNATIVES:**

Property owners should not illegally burn wastes. Even for those materials that are legal to be burned, property owners should consider the following options instead of burning wastes:

- Reduce packaging waste by buying in larger quantities, and demand less packaging when purchasing products.
- Reuse items - find someone else who can use it, have a yard sale, or donate it to a resale organization.
- Recycle newspaper, office paper, corrugated cardboard, magazines, aluminum, metal and acceptable plastics.

- Compost leaves and plant clippings. Managed outdoor composting of raw vegetables, bread, egg shells, coffee grounds and similar food wastes is allowed by most communities in Wisconsin, and many communities have compost bin sales programs. UW-Extension and DNR provide informational resources about composting to local governments and individual citizens.
- Chip brush and clean wood to make mulch or decorative chips, use it as heating fuel in wood stoves or boilers, or allow it to decompose on its own.
- Dispose of allowable waste materials at a licensed landfill. The DNR Waste Program provides information about what items may be disposed of at licensed landfills.
- Properly dispose of household hazardous wastes. County Solid Waste Departments provide information on how to dispose of these items.

## **K. Household Hazardous Waste**

Household hazardous wastes include many common products, such as fluorescent bulbs, car batteries, computers, and certain paints, cleaning products, and old pesticides that contain hazardous components. When generated by a business, these products are prohibited from landfill disposal in Wisconsin, but the landfill prohibition does not apply to these products when generated by a household.

Many of these products also contain materials that are of significant value, such as silver, nickel, and copper found in computers. Wisconsin's universal waste rule (modeled after federal rule) allows these products to be effectively recycled under in a manner that is significantly less onerous than would otherwise be required. This has played an important role in increasing the amount of these used products being recycled, rather than disposed in landfills. Many other household hazardous wastes do not contain materials of significant value, or at least not in a form that can be easily recovered. Most of these household hazardous wastes are destined for disposal.

Many communities have developed programs in an attempt to prevent these used products from being disposed in solid waste landfills. Wisconsin has nine permanent household hazardous waste collection facilities, operating primarily by counties (1999). These permanent facilities collected about 1 million pounds of household hazardous wastes in 1997, consisting mostly of solvent, pesticides, and paints. Some communities have organized events known as "material exchanges" and "clean sweeps". These events help find a new use for some of the used products, while the remaining used products are collected for disposal at a hazardous waste landfill. Twenty two Wisconsin counties are trying to hold these events annually, and 35 other counties have held at least one at sometime in the past. All totaled, only four Wisconsin counties have neither held a clean sweep event nor have a permanent facility, giving strong indication of their popularity. Even so, many residents do not have access to household hazardous waste services because costs can be substantial, and it is difficult to identify funding sources. As a result much household hazardous waste is disposed in solid waste landfills.

## **L. Hazardous Waste**

Fewer businesses in Wisconsin are generating hazardous waste, and those that do are generating less of it. Numbers of both large quantity hazardous waste generators (more than 2,200 pounds per month) and small quantity generators are declining. Hazardous waste generation in Wisconsin fluctuated from about 500 tons per year to nearly 900 tons per year between 1990 and 1995. However, a significant downward trend is apparent in later years with hazardous waste generation ranging from about 400 to less than 500 tons per year (1996 through 1998). In 1998, the total amount of hazardous wastes generated in Wisconsin was 430 tons. Less than half of that (39%) was shipped for treatment or recycling within Wisconsin, with the remaining portion exported to other states.

Generation of hazardous waste, like the generation of other industrial wastes, is in part related to the amount of business in certain industry sectors, and may also be related to the gain or loss of businesses. However, the single most important factor that has influenced a reduction in hazardous waste generation is the increased public awareness (nationwide) of extreme detrimental impacts caused by improper disposal of hazardous waste, as demonstrated by events at Love Canal, New York that became widely publicized in the 1970's. As a result, stringent federal and state laws were passed to closely regulate hazardous waste activities and compel businesses to clean-up environmental problems caused by improper management of hazardous wastes. The number of hazardous waste generators varies less than the amount of hazardous waste generated. From 1990 to 1995, Wisconsin's large quantity generators remained at about 600, with a slight decreasing trend in 1994 and 1995, leading to a sharp drop to less than 400 large quantity hazardous waste generators in 1996. Similarly, Wisconsin's small quantity generators saw a decreasing trend in recent years, from about 1600 in 1993 to less than 1000 in 1996. In response to public concerns and high costs, businesses have made great strides in reducing the amount and toxicity of their hazardous wastes, through material substitutions, process improvements, and on-site treatment and recovery of hazardous chemicals. In recent years, WDNR has greatly increased outreach efforts to Wisconsin businesses to encourage waste minimization and pollution prevention activities.

Wisconsin's hazardous waste generators include a wide variety of businesses, but large quantity generators are heavily represented by the following industries: paper products, chemicals, fabricated metal products, industrial machinery and equipment, and electrical utilities. Wisconsin's hazardous waste management services are limited to transportation, transfer, storage, and treatment. There are no hazardous waste landfills operating in Wisconsin. However, many hazardous wastes generated in Wisconsin are disposal in other states, most notably Illinois and Indiana. Much of Wisconsin's hazardous waste is also treated at out of state facilities.

## **Appendix 7.2. Issue Papers on the Future of Waste Management**

**Issue #1:** How do we assure the implementation and delivery of cost effective solid waste and recycling services?

### Problem Statement

Assuring cost effective delivery of solid waste and recycling services is an ongoing issue in Wisconsin. Currently, these services vary not only in effectiveness and efficiency, but also in price. This variation is influenced by a number of factors that include:

- geographic location,
- level of service,
- size of the service area,
- availability of service providers, and
- type of service provider.

In addition, some areas incur “excess” prices because they lack the experience and/or understanding of current market conditions.

Determining whether a service is cost effective can also be difficult. Cost effectiveness can be measured in the short-term or in the long-term perspective, potentially resulting in some programs that are cost effective in the short-term but not the long-term and vice versa. In addition, cost effectiveness and providing a common level of services may not reach the same point.

### Impacted Parties

Local government officials, residents, and waste haulers.

### Options

Options to address the issue include:

- designating the responsibility for planning and delivery of solid waste and recycling services to a county or regional entity;
- arranging service delivery around service areas or common geographical/political areas which allow for increased competition and improved efficiency, especially for collection;
- establishing a common level of service which requires the identification of the universal components of a coordinated solid waste management system;
- developing joint procurement and purchasing contracts organized around service areas;
- providing consistent posting of information regarding solid waste and recycling contracts; and/or
- developing an ad hoc group to evaluate service levels and their effectiveness and to work with high cost programs to reduce costs.

## ***Issue #2:*** Should we further limit open burning and on-site burial of solid waste?

### Problem Statement

Wisconsin law allows residential land owners to burn small quantities of dry combustible household waste, such as paper, cardboard, leaves, brush, plant clippings, and untreated and unpainted wood. Burial of household waste is also allowed on private property where it is generated unless prohibited by local ordinance. These options are available to many suburban and rural residents throughout the state.

Burning household trash has increased in Wisconsin. The number of seasonal burning permits for burn barrels grew from 24,000 in 1985 to 60,000 in 1995, with the bulk of this increase occurring around the time Subtitle D landfill requirements took effect. It is important to note that the number of burn barrels is certainly much greater than the above numbers suggest, since burning permits are not required in some parts of the state. With an estimated 700,000 non-farm, rural homes in WI, and 79,000 farms, it is reasonable to assume that 500,000 residences utilize burn barrels. Burning trash at home raises safety and health concerns. Burning of refuse by households is a major cause of forest fires in Wisconsin. Residential trash burning generates significant amounts of air pollutants in the form of particulates, sulfur oxides, nitrogen oxides, volatile organic compounds, and carbon monoxide. Burning trash also raises some legal issues. Many residents burn paper and cardboard that could be recycled. Many residents also burn wet paper, plastics, and other wastes, even though state law prohibits burning of these materials.

There are no data available on the number of landowners who dispose of household waste on their own property and the amount of material managed this way in the state. Besides potential litter and rodent problems associated with this method of home disposal, there is the possibility of leachates from these sites contaminating water supplies. Good stewardship of the land is compromised when ravines and the “back forty” are used for waste disposal. Sale of the land, or passing it on to heirs, may be compromised when burial of agricultural and residential waste has occurred.

### Impacted parties

Suburban and rural property owners and their neighbors face health and safety risks from open burning and home disposal of trash. All citizens of the state may be affected by degradation of air quality. Future use of land that has been used for dumping may be restricted; impeding development, and reducing property tax revenue.

### Options

Restricting or prohibiting home disposal of trash through burning and burial is a logical but politically difficult solution. Here are three options:

1. Legislative: Ban residential trash burning and burying statewide. Increase fines for illegal dumping.

2. Voluntary elimination: Expand education efforts to make residents and local officials more aware of the problems associated with home burning and disposal of trash.
3. Expand enforcement powers: Give fire control staff the authority to cite violators who burn materials that are not supposed to be burned (recyclables, tires, oil, etc.)

**Issue #3:** What are the future needs for processing and disposal capacity? And how are these needs impacted by changing solid waste streams and life cycle analysis?

### Problem Statement

Projecting the future needs for processing and disposal capacity in Wisconsin is an ongoing challenge. While some parts of the state are currently experiencing surplus capacities, other areas are suffering from inadequate markets or disposal opportunities. In addition, projecting future needs is complicated by a changing solid waste stream. The types and quantities of materials within the solid waste stream are influenced by consumer preferences and changing technology. For example, increased consumer demand for prepared foods and meals will most likely result in increased reliance on plastics and composite packaging materials. The impact of technology on the solid waste stream is also great. With the increased reliance on computers, we are slowly moving toward a paperless society. Additionally, technological advances have allowed many products that were once packaged only in glass to now be packaged in plastics. Some of these changes may reduce the volume and weight of the solid waste generated. However, these changes may also result in the decreased recyclability of some items, thereby increasing future disposal needs.

Using life cycle analysis to analyze solid waste options is an emerging technology. Life cycle analysis can be used for a variety of purposes which include: identifying items to be recycled, determining what should be recycled, and/or determining where to direct limited resources for the best payoff.

### Impacted Parties

Recycling managers, landfill operators, local government officials, consumers, manufacturers.

### Options

There are several options that can be used to address the future processing and disposal capacity needs in Wisconsin, which include:

- mandating or encouraging manufacturers to incorporate “design for reduction and recycling” standards into their products;
- educating consumers on wise purchasing habits;
- maintaining the status quo;
- using life cycle analysis to evaluate the entire solid waste system and recommending amendments to state laws as needed;

- setting a statewide “ceiling” on solid waste facilities based upon implementation of expanded recycling and reuse options; and/or
- developing regional service areas to plan and implement activities to meet processing and disposal needs.

**Issue #4:** What are the long-term impacts of today’s “dry tomb” landfill design?

#### Problem Statement

The decomposition of wastes within landfills results in the production of gas and contaminated liquids and subsequent differential settlement of the landfill surface. To reduce the amount of decomposition occurring within the landfill and therefore reduce the volume of gas and leachate needed to be collected and treated, landfills are designed to prevent water from coming into contact with the waste. This creates dry areas within the landfill where decomposition does not readily occur. While this does not pose a problem in the short-term, it can pose potential problems in the long run.

Current solid waste regulations require a 40-year long-term care period after a landfill is closed. It is reasonable to assume that the integrity of landfill liners and caps will begin to deteriorate at some point after the 40-year long term care period. As the liners and caps deteriorate, wastes that were formerly protected from moisture will begin to decompose, generating explosive gases and leachate, and potentially leading to surface subsidence. Even though landfill owners are responsible for the maintenance and cleanup of landfills in perpetuity, landfill owners are not required to set aside funds for this maintenance and cleanup after the 40-year long term care period.

#### Impacted Parties

Landfill operators, future landowners, future taxpayers

#### Options

Options to address the issue include:

- promoting the use of landfills as bioreactors (decomposition of wastes within a landfill during the operational life and 40-year long term care period); and/or
  - ⇒ encourage leachate recycling
  - ⇒ delay placement of final (impervious) cap
  - ⇒ addition of sewage sludge
- processing the waste prior to landfill disposal- to stabilize it, by removing or treating organics
  - ⇒ source separation or removal of easily decomposed organic waste
  - ⇒ processing through a digester/composter system (e.g. Columbia County)
  - ⇒ in-place composting at a landfill prior to placing stabilized waste in a final disposal cell



**Issue #5:** Should landfill design requirements and concerns be balanced with land use considerations?

#### Problem Statement

Wisconsin's Solid Waste Rules limit the length of leachate collection pipes to ensure that the pipes can be cleaned if an obstruction or blockage develops. The Department is also concerned with recent proposals for deeper, higher landfills and the forces the resulting waste depths exert on leachate collection and removal piping. This piping must remain functional for decades following closure of a landfill. Larger, deeper landfills increase the design risk.

The Department's landfill design requirements result in more acreage being devoted to landfills. This occurs because far more waste can be placed in one 100-acre landfill than two 50-acre landfills. They may also result in greater scattering of landfill locations than would otherwise be the case.

#### Impacted Parties

Landfill owners, all citizens.

#### Options

- Continue to deal with issue at Program level.
- Leave it to the applicants' consultants.
- Develop issue more fully and seek guidance from Department Administration with respect to the appropriate level of conservatism in our design requirements.

**Issue #6:** How should the solid waste management hierarchy be applied or further implemented? What role should the state play in promoting it?

#### Problem Statement

According to state statutes, the state's solid waste hierarchy is: reduce, reuse, recycle, compost, incinerate with energy recovery, landfill, and incinerate without energy recovery. But in fact, the waste hierarchy is a policy statement rather than a requirement. To date, the majority of the state's emphasis, including technical and financial assistance, has been on recycling and composting for local responsible units of government. As of 1995, 60.5% of Wisconsin's municipal solid waste was landfilled, 36% was recovered for recycling/composting and 3.5% was combusted for energy recovery. Waste reduction and reuse have received limited technical and financial assistance, resulting in little information regarding the costs and effectiveness of these options.

Disposal costs for landfills and waste-to-energy facilities are relatively inexpensive in the state, although they still represent a significant cost factor to most communities. Decreasing tipping fees have raised a serious issue concerning the state's adopted hierarchy – should the hierarchy be implemented because of the long-term environmental (and possibly economic) benefits of reduced reliance on disposal technologies, even if the short-term costs are higher?

### Impacted Parties

Residents, landfill operators, taxpayers, businesses

### Options

Options to address the issue include:

- implement the existing hierarchy, recognizing that: reduction, reuse and recycling efforts are sometimes more expensive on a per ton or per person basis than disposal is and; the savings and benefits are longer term or measured in terms of avoiding the cost of groundwater and soil remediation work;
- modify the existing hierarchy to be in line with the least costly solid waste management alternative;
- status quo; continue to allow local programs to decide on how the hierarchy is to be implemented and provide technical and financial support for those decisions; and/or
- implementing legislation to increase tipping fees at both private and public disposal sites.

**Issue #7:** What is the role of state funds and staff in the future for solid waste management and recycling?

### Problem Statement

In 1990, Wisconsin committed to spending approximately \$300 million over a ten-year period to support the development of local recycling programs, stimulate markets, and fund staff in six agencies. During the 1997 budget process, the Legislature extended the local government grant program until the year 2004, providing \$24 million per year for grants. These grants currently cover about 35% of local government costs for recycling programs. As we look toward the future, several issues regarding funding are raised including:

- at what point will recycling programs and markets be self-sustaining?
- what level of state grants to local governments is necessary; what level will encourage self-sufficiency?
- is there a long-term need for state agency involvement to:
  - enforce landfill/incineration bans;
  - monitor continued effectiveness of approved recycling programs;
  - develop solutions when local governments have problems marketing specific materials;

- provide statewide information, education and technical assistance on recycling and waste reduction;
- provide statewide purchasing/buy recycled information to local governments; and/or
- monitor compliance with minimum recycled content standards, labeling plastic containers and use of the terms *recyclable*, *biodegradable*, etc.?
- to what extent can state agency recycling responsibilities/program delivery be combined with and performed by other staff?
- is there a new approach to staffing recycling and waste management positions that would enable fewer staff to deliver services effectively?
- what new structure for delivering waste management/recycling technical assistance/compliance monitoring at the state level would deliver programs effectively using fewer staff?

### Impacted Parties

State and local government officials, state agency staff, taxpayers, manufacturers

### Options

Options to address the issue include:

- providing minimal state involvement in recycling and no grant funds for recycling after 2004;
- maintaining the status quo, i.e. continued emphasis on recycling activities through state grants and technical assistance;
- realign state grants and technical assistance to support waste reduction and reuse activities more thoroughly than recycling;
- expanding the state role into new areas; provide additional grant funding to support a higher proportion of local government costs, including implementation of a coordinated solid waste management system.

**Issue #8:** What future approach(es) should be used for management of solid wastes that contain hazardous substances

### Problem Statement

Some solid wastes contain hazardous substances and it is desirable to keep these waste out of landfills. In many cases these wastes would be regulated as "hazardous waste" except for the fact that they originate from households. This is true for mercury-containing lamps (neon and fluorescent tubes), televisions and other types of cathode ray tubes, household waste solvents, pesticides, oil-based paints, electronic circuit boards, unusable waste gasoline, waste antifreeze, batteries, automotive fluids, used oil filters and waste tires. These wastes require special consideration to ensure best management practices.

Issues associated with these materials include:

- Should additional materials beyond those presently listed in s. 287.07, Stats, be legally banned from disposal in landfills?
- Should government "responsible units" for recycling be encouraged or perhaps required to establish collection programs or collection facilities for any of these waste materials? Should collection and/or education efforts by RUs be state grant eligible?
- Should the state household hazardous waste clean sweep grant program be expanded? eliminated? combined with the agricultural waste chemical clean sweep program?
- If recycling were required, is there adequate infrastructure within the state to assure that these materials can be separated from the municipal waste streams and recycled? What additional recycling infrastructure is needed in the private sector? How can this be accomplished?
- What role, if any, should waste haulers and landfill operators have in keeping these materials out of landfills?
- Should the state or recycling responsible units be providing services to small businesses that generate very small quantities of these same wastes?

### Impacted Parties

Since this category of wastes is generated by households, all citizens of the state could be impacted. Parties with particular concerns could include businesses that generate these wastes, business that treat or recycle these wastes, recycling responsible units, county or local governments that receive household hazardous waste clean sweep grants, the DATCP agricultural waste clean sweep program, waste haulers and landfill operators.

### Options

There are many options ranging from status quo to major changes. Some options are listed as "issues" in the "Problem Statement" section above. These options include landfill bans, additional mandates and funding for recycling programs and major changes to clean sweep programs ranging from elimination to consolidation or expansion.

### **Appendix 7.3. External Meeting Notes, July 1998**

QUESTION #1: WHAT ARE YOUR THOUGHTS ON THE ISSUES THAT HAVE BEEN IDENTIFIED?

#### *Group #1 (lead by Gene)*

- need to look to Europe/Japan for their experience
- open burning/dumping a minor issue
- less data gathering/more action (need a balance)
- avoid dictating responsibilities/surcharges etc.
- issues #4 and #5 were too technical and shouldn't be included

#### *Group #2 (lead by Dennis)*

- issue 1: -is there a problem to solve?
  - one size fits all is inefficient
  - crisis coming with recycling funding uneven services; may not be able to maintain current system in next millennium
  - critical need for ongoing research money
- issue 2: -ban it
  - enforcement problem
  - key is education
  - non-attainment area ban
- issue 3: need continued investment in recycling infrastructure
- issue 4: need to experiment with bioreactor concept; option is to require composting before landfilling
- issue 6: leave hierarchy as goal
- issue 7: separate committee, stay away from this

#### *Group #4 (lead by Kate)*

- issue 1: -what makes for an efficient planning unit?
  - can we help identify?
  - look for broad criteria
  - solid waste disposal may require different organization from recycling
- issue 2: don't forget private sector trends e.g. growth in recycling operations for special materials
- issue 3: public sector has stepped back and let private sector do solid waste management

#### *Group #5 (lead by Steve)*

- on target- future materials critical
- surprised at participation at household hazardous waste programs- more description of how handled
- issue 2: small percentage of population marginal- banned eventually
- issue 5: land use concern not too relevant (too hot a topic)
- issue 6: perception of non-adherence to hierarchy untrue

- issue 7: state financial programs need evaluation
- stay away from funding for recycling

## QUESTION #2: ARE THERE OTHER ISSUES THAT HAVE NOT BEEN IDENTIFIED?

### *Group #1 (lead by Gene)*

- barriers to market development for recycling (Legislative and Administrative) (market barriers) (create economy of scale)
- integrated waste management
- interstate waste/flow control/impacts on capacity and recycling
- strategy for delivering message

### *Group #2 (lead by Dennis)*

- non crisis- not plugged in politically, uncertainty = inaction
- decisions already made?
- is there any cost efficiency problem?
- mandatory services will push costs up
- lack of info in public sector citizenry
- outreach continues to be necessary due to changing local government
- (household hazardous waste, agricultural, business) local governments want to be efficient by packaging services and state grants aren't necessarily flexible
- how to encourage businesses to go beyond compliance

### *Group #3 (lead by Joel)*

- good ways to measure results
- no discussion on enforcement (recycling and solid waste)
- identify factors common to most cost effective programs (separate issue)
- can local programs be sustained without state subsidies?
- redefine solid waste term- should not include items to be recycled (in commerce)
- research needs/opportunities
- "markets" not really addressed - education?
- time to look at how widespread recycling is in commercial sector
- expand recycling to include all sectors of waste- like high volume
- look at privatizing operations of landfills- de-emphasize command and control from DNR
- coordinated management of all waste
- look at money allocated for recycling- environmental costs and benefits
- tax incentives for recycling activities in business (review and possible expansion)
- what powers need to be given to different entities to improve program
- serious review of economics of recycling and solid waste (consolidation)
- alternative sources of funding for different program elements
- zero-based budgeting
- subsidy of virgin materials- impact?
- education- discussion important; important to add to program- make changes

*Group #4 (lead by Kate)*

- what is “the problem?” - aren’t we doing well with solid waste management?
- identify the positives e.g. landfill siting law is working
- are programs not cost-effective? - get comparisons with other states
- what impact will population growth have? - factor in state population growth; analyze subsets of total (residential, commercial, industrial)
- need cost data- include cost of maintenance, remediation of closed landfills
- how to ensure availability of services/competitive bids in some parts of the state?
- incentives to allocate resources more efficiently?
- look at different models including other states for recycling and solid waste
- what results from \$?
- is it time for a planning initiative for/by local governments? - technical assistance on integrated waste management.

*Group #5 (lead by Steve)*

- what if recycling funds go away- will communities continue to recycle? (funds and mandate help)
- enforcement of bans almost non-existent- how can locals do it? (Madison uses clear bags)
- how do we know that communities are not providing excessive service due to state grants?
- negative incentive of grant program
- need to have legislative audit of entire program
- focus on “problem” materials
- provide flexibility and relief from landfill bans
- look long term- where do we want to be in 50-100 years?
- how can we make recyclable material products competitive?
- how do we increase consumer responsibility
- what has business done to comply with recycling and to make it work?

Meeting Attendees:

NAME	WHO YOU REPRESENT
Terry Grosenheider	Department of Commerce
Dan Kolberg	Wisconsin Society of Professional Engineers
Hank Koch	Waste Management
Bob Pearson	Department of Transportation
Rich Weber	Wisconsin Assoc. of Consulting Engineers
Sue Gau	US Oil Co. Inc.
Richard Stadelman	Wisconsin Towns Association
Jim Lingle	Wisconsin Utilities Association
LeRoy Wilder, Jr.	Northern States Power Co.- WI
Roger Springman	Department of Agriculture
Sharon Clark Gaskill	Madison Audubon Society
John McGaa	5R Processors Ltd.
Thomas Drake	5R Processors Ltd.
Gary R. Steede	Outagamie County

Ed Wilusz	Wisconsin Paper Council
John Datka	Sal Service Inc.
John Karsten	Terra Engineering & Construction Corp.
Gerald Nolte	UW-River Falls
Sandra George	Wisconsin Newspaper Association
Lisa Hilbert	National Solid Wastes Management Assoc.
Carol Diggelman	Milwaukee School of Engineering
Daniel P. Meyer	Council on Recycling
George P. Dreckmann	City of Madison, Associated Recyclers of WI
Kevin Hardie	Glass Packaging Institute
Terry J. Mesch	Associated Recyclers of Wisconsin
Brian Tippetts	SWANA
John Reindl	Council on Recycling
Karl Bryan	Wisconsin Environmental Initiative
Dennis Mack	DNR
Kate Cooper	DNR
Tom Blewett	UW-Extension
Joel Stone	DNR
Al Zeltner	ZAC, Inc. Barron County WTE
Lynn Morgan	Waste Management, Inc.
Carol Kubly	Council on Recycling
David Sonnentag	Superior Services, Inc.
Sue Ann Kraus	Goodwill Industries of South Central WI
Kelly Mella	DNR
Jennifer Ketola	DNR
Bobbi Pagel	UW-Extension
Gene Mitchell	DNR
Pat Walsh	UW-Extension
Dan Fields	DNR
Deb Pingel	DNR
Kathy Curtner	DNR
Jeff Schoepke	Governor's Office
Eileen Norby	UW-System
Bill Casey	WCSWMA
Myron Vieau	Oneida Nation Environmental
Phil O'Leary	University of Wisconsin
Dave Keeling	Steel Recycling Institute
Gail Miller Wray	Recycling Markets Development Board
Kathy Johnson	League of Women Voters of WI
Leo Talsky	Department of Administration
Julianna Nelson	SPI/American Plastics Council
Chuck Ott	BFI
John Hendren	Recycling Markets Development Board
Mary Kohrell	UW-Extension
Peter Peshek	WISRI/BFI
Brian Mitchell	Wisconsin Cast Metals Association
Pat Stevens	Wisconsin Manufacturers and Commerce
John Owens	Wisconsin Merchants Federation

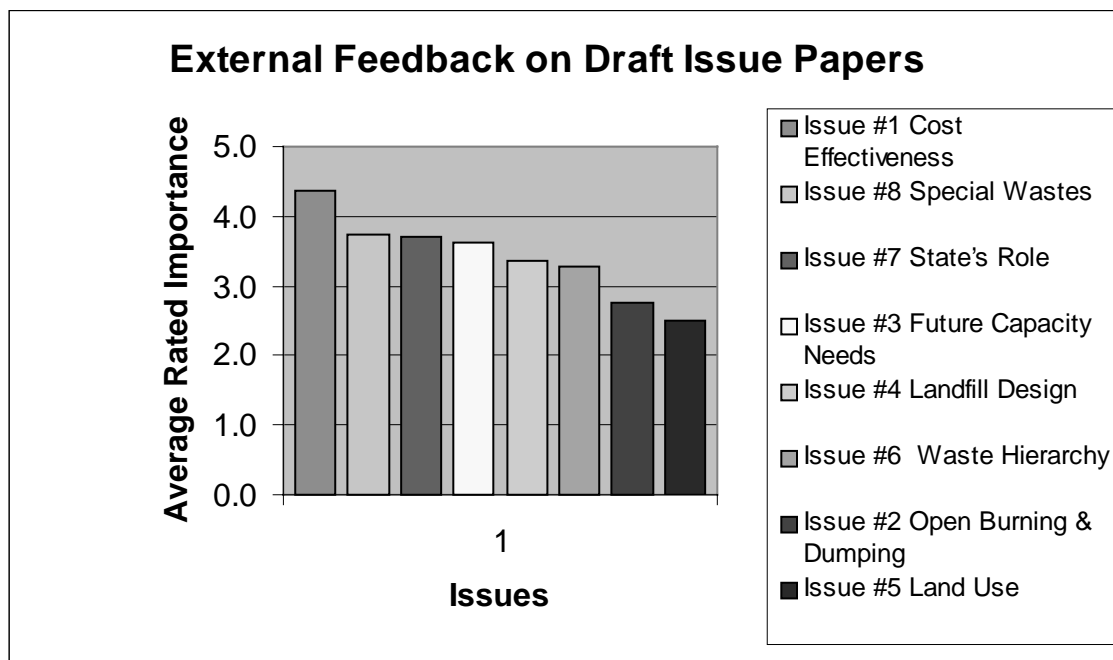


## Appendix 7.4. External Feedback on Draft Issue Papers

Another question asked of the attendees was, "Of the additional issues brought up at this meeting, which one or two do you think are most important and why?" Responses were not limited to additional issues, but instead many responses were made to reiterate the importance of the issue paper topics. Also, none of the responses addressed the "why" part of this question. Common themes of the responses included the following:

- Factors should be identified which make programs more efficient or cost-effective (issue #1): mentioned 10 times
- Need to look at/plan for the long-term for sustainability: mentioned 7 times
- Importance of consolidating/integrating recycling/sw programs (issue #1): mentioned 5 times
- Importance of continuing education: mentioned 4 times
- Need to look to other states or countries to compare/learn: mentioned 4 times
- Importance of continuing state grants/funding (issue #7): mentioned 3 times

The data from these responses is summarized below, in chart form.



## Appendix 7.5. Stakeholder Post-Meeting Evaluations

A brief survey regarding the July 28 stakeholder meeting was sent to 103 stakeholders, including those who attended and did not attend the meeting. The survey was designed to obtain the stakeholders feedback on the format of the meeting, and to gain a better understanding of how the stakeholders would like to be involved in the study process.

A total of 19 responses were received. Overall, most found the meeting to be informative and enjoyed the overall meeting format, particularly the small focus groups. Additionally, many expressed an interest in being involved in document review. However, the comments also revealed that many stakeholders felt as if they were not given enough time to discuss the issues. Below is a complete listing of the comments received. The comment number corresponds to the survey respondent. A list of survey respondents can be found at the end of the document.

*Question 1: If you attended the July 28 meeting, please tell us what you liked and didn't like about the meeting format.*

1. Very informative. Good time management. Very long sessions. Need more or longer breaks.
2. Going through the reading material was a waste of time for us who had read and absorbed the information prior to meetings. Focus groups too short in time. Liked to see all the stakeholders there. Felt sorry that there isn't dedicated staff and everyone has to adjust already full workloads.
3. I enjoyed meeting the other individuals with interest in the solid waste/hazardous waste area and hearing their concerns and needs. I found the meeting very frustrating owing to the number of attendees and the format. The time was simply way too inadequate for meaningful dialogue. What bothered me most was the sense that the stakeholder's group was going to be used as a "reactive vehicle" (ie: to react to reports, recommendations, etc. prepared by DNR/SHWEC). This is in total opposition to my beliefs. If a stakeholder's advisory committee had helped review major issues, we wouldn't have had the eight that showed up several weeks ago. I want to be involved in a proactive effort.
4. I liked the format. Some presentations were very good. Some needed additional work. I would have liked to see more of a focus on the positive things that WI has accomplished thru the recycling law as well as an attempt to determine areas of consensus. There was not enough time given to the breakout groups.
5. I did not attend the meeting , but do intend on being at the next gathering.
6. Well run, kept to timeline, change to listen and share, good use of overheads.
7. Was not able to attend.

8. Liked pace. Disliked large unexplained void between charge and options. What was the analytical process?
9. Very good issue by issue overview. Might have gone through these even faster. This could have left more time for discussion.
10. It was good to get together and hear some thoughts from others. But I think we need more time together, higher expectations for a finished product, and a consensus or movement thereof of some basic principles such as the natural step. Without an agreement of these basic principles, it will be difficult -- or impossible --to agree on the tougher challenges ahead.
11. Disliked: too much time spent reviewing (verbatim) issue materials mailed in advance; not enough time spent in focus group discussion; participants heavily weighted by private sector; marginal issues, e.g., burning, leachate collection. Liked: focus group discussion.
12. Did not attend.
14. Not able to attend.
15. N/A.
16. Good: thoughtful preparation, well-organized, kept to schedule and timeframe, honest realization of lack of funding for full process. Bad: staff need more data on things (such as water being degraded by landfills nearby), didn't see the need for a formal facilitator-got repetitive-staff could do this, needs an emphasis on future (needs of society) rather than economic needs of stakeholders-what is right for future citizens, the real stakeholders-educate about population and sustainability and examination of shifting emphasis to reduction and reuse.
17. The meeting succeeded in relaying information but was less successful in eliciting feedback. The opportunities for input were constrained and too structured, restricting feedback to narrow questions. Need to request feedback on overall approach.
18. Good meeting! Liked the combination of large group, small group, and written survey.
19. Information presented was good, and liked receiving info ahead of time. The meeting format was good, but would like a more "formal" opportunity to comment.

*Question 2: How would you like to see future stakeholder meetings structured? Please be as specific as possible.*

1. I don't know how it could be structured, but Outagamie County would like input on all issues being discussed that could affect the county.

2. Focus rushed and crammed into-more discussion of simple topics and consensus. Can we have minutes of last meeting so we can read before next meeting? Like to know where we are heading and who is target audience for outline.
3. I won't attend another meeting like this one. Nor will I attend a meeting just to review a document. In short, without a substantial, meaningful process behind the stakeholder's study committee, there is need for serious outside party involvement. The meetings are the issue per se. If DNR/SHWEC truly believe in meaningful outside input, an advisory group should immediately be appointed to work with staff over the coming two months. The output from these efforts should be a review of all pertinent issues (not just the 8 presented), a concept paper for involving the Legislature in the process, a timetable for the next 8 months, and a draft outline of a prospective final report. There is little point to gather 40 to 60 people together for a 4-hour meeting if you want serious input. We need one whole day (or more) to break up into numerous small groups to examine different topics and assist staff in working through issue details.
4. An undertaking this large needs subcommittees with a clear objective. Subcommittees would then have a goal, a set of objectives to reach the goal, etc. DNR/SHWEC do not have the resources without assistance from the private sector, local government, etc. to do justice to such a large undertaking.
6. The same.
7. Not too many. Not too long. Use other communication methods as much as possible.
9. More time for discussion is my only suggestion.
10. Give examples of more efficient/comprehensive/environmental superior solid waste systems. Describe present conditions, future trends (consolidation, global climate change, amount of oil left, amount of subsidies given to virgin materials, etc.).
11. Rotating focus groups with mixing and blending of participants to provide opportunity for commenting on different issues and with different participants.
12. Hard to answer.
13. The Structure was fine.
15. NA.
16. We need to decide where we want to get to. I appreciate factual presentations by staff complete with data on what is being done elsewhere (especially innovative, forward-looking programs), followed by discussion focused on how Wisconsin can prepare for 50 years from now.

17. See above.
18. Similar structure seems appropriate given large group size. Allow enough time to provide feedback on draft documents.
19. I'm nervous about the "public" process, and giving the appearance of consensus on the document when all parties haven't been notified of a public meeting, and haven't had the chance to comment. This will have an impact on the final report.

*Question 3: Please give us a few ideas about how you or your organization would like to be involved in the process of developing the study report, e.g., document review or having study committee members attend one of your organization's meetings.*

1. Outagamie County is very interested in the outcome and recommendations the committee makes to the legislators, as these will affect Outagamie County. I would like to attend future meetings and would certainly like to have input in the final recommendations.
2. RMDB give report on markets-where, when and how are markets 1980-present.
3. My prime concern is the hazardous waste area. Early indications suggest that this topic area is more of a sideline concern. Why not get two advisory groups to the stakeholder's effort: one could deal with solid and the other hazardous wastes. I am prepared to help, but I need to know that my time is well spent.
4. We would be willing to participate in these areas that either impact or are impacted by market development issues.
5. Bowater can provide expertise with the markets for waste paper.
6. Speaker to local leagues or state convention next May.
7. Provide opportunity to summarize data and implications for the materials we have (HHW, VSQG, permanent collection programs).
8. Review and comment.
9. WEI may be able to facilitate similar multi-stakeholder projects in the future. Next time SHWEC/DNR are planning a project, include us in the discussion early to see if we can contribute.
10. I would be glad to review documents, research specific questions, have team members attend council meetings, write articles for group newsletters, etc.

11. AROW already planning on committee member attendance at Aug. West WI regional workshop...perhaps a repeat in Nov. in a different part of the state (southeast).
12. We would like to receive any reports that have been produced or will be produced. We will try to provide input to your process, as appropriate.
13. I am not sure the issues in the report are in alignment with the issues the audience feels are important. The issues in report may have an agency bias.
14. Document review.
15. The Sierra Club would like to review a draft outline and a draft document.
16. We need to be involved in document review.
17. Would appreciate any and all opportunities to review documents and plans. Would be willing to be part of a smaller stakeholders group to work through issues in more detail.
18. Document review. Policy development input. Feedback on SWM costs.
19. Would be willing to be part of a smaller stakeholders group to work through issues in more detail. Important to acknowledge that we may find consensus on some issues, but not on others.

*Survey Respondents (\* indicates they attended first meeting)*

1. Gary Steede, Outagamie County\*
2. Gail Miller Wray, RMDB\*
3. Roger Springman, DATCP\*
4. John Hendren, RMDB \*
- ~~3.~~5. Dan Haight, Bowater (Avenor)
- ~~4.~~6. Kathy Johnson, League of Women Voters \*
- ~~5.~~7. Elaine Andrews, UW Environmental Resources Center
- ~~6.~~8. Ed Wilusz, Wisconsin Paper Council \*
- ~~7.~~9. Karl Bryan, Wisconsin Environmental Initiative \*
- ~~8.~~10. John Reindl, Council on Recycling \*
- ~~9.~~11. Terry Mesch, AROW \*
- ~~10.~~12. Susan Mudd, Citizens for a Better Environment
- ~~11.~~13. Phil O'Leary, UW-Madison \*
- ~~12.~~14. Jenna Kunde, WasteCap Wisconsin
- ~~13.~~15. Caryl Terrell, Sierra Club
- ~~14.~~16. Sharon Gaskill, Madison Audubon Society \*
- ~~15.~~17. Lynn Morgan, Waste Management, Inc. \*
- ~~16.~~18. Dan Kolberg, Wisconsin Society of Professional Engineers \*
- ~~17.~~19. Pat Stevens, Wisconsin Manufacturers & Commerce (phone) \*

## **Appendix 7.6. External Meetings on Cost Effectiveness, August 1998: Key Factors Driving Cost Effective Programs**

Key Factors Driving Cost-Effective Programs- 8/19/98 Wausau (as identified by the entire group)

- population density (low density = more difficult to implement)
- public v. private
- competition
- level of service/convenience
- knowledge of program (ability to adapt as programs change)
- number of lbs./ set-out (in curbside programs)
- pre-sort v. commingled (pre-sort = less costly)
- decrease number of vehicles/people with same level of service
- integrated, one-stop processing facility
- cooperation/attitude of generators (education)
- integrated collection/contracting (for entire package)
- small communities and contracting- cooperative contracting needed
- need to spread knowledge that recycling is environmentally friendly- proactive education
- difficult to quantify environmental benefits
- public v. private paying
- lack of knowledge at local units of government in contracting (result of lack of competition)
- proximity of end-markets (esp. for glass and paper)
- dedicated managers (paid) v. volunteers
- paying markets- capturing the full value of the material (product bans- ex. PET contamination- driving recycling costs)
- keeping people employed- need change in service or less staff?
- vehicle capacity (availability of capital)
- user fees for actual users (ex. yard waste)
- increase manufactures' responsibility to capture recyclables and produce recycling friendly products
- pricing incentives to encourage behavior (ex. VBFs)
- eliminating duplicate costs, esp. with small, adjacent communities (need cooperation)
- access to efficient transportation, esp. small communities- need to minimize costs (also need proper equipment)
- increase waste reduction efforts
- formation of county units
- overcoming the "we've always done it that way" attitude
- capture rate- lower percentage = less efficient (burning in small communities)
- length of contract (longer usually better)
- fair bidding process (politics)
- need mandatory solid waste collection (need to say what materials need to be collected)- lack of enforcement by RUs, also need state enforcement- lack of staff

- collection crew size (not more than one person per truck)
- need role in solid waste collection- assign responsibility
- who bears the risk? (commodity prices) cost-effective programs bear more risk
- route design
- travel times/MRF (transfer station, landfill) location
- standardized programs to increase efficiency (same level of service)
- taking local units out of it (all private)??

The above were divided into the three categories shown below:

#### Administrative/Consolidation (issues identified)

- knowledge of program/ability to adapt and change
- integrated collection/contracting for entire package
- cooperative contracting in small communities/knowledge about contracting
- dedicated managers (for solid waste and recycling) rather than “volunteers” (clerks); training required to qualify
- willingness to reduce staff if not needed for solid waste/recycling management
- user fees for services (e.g. yard waste collection)
- pricing incentives to encourage behavior (like VBFs)
- eliminating duplicative costs, e.g. small adjacent communities cooperating on a drop-off site
- formation of county or other units to improve efficiencies of scale
- long term contracts
- fair contract bidding process (politics)
- need mandatory solid waste collection (assigned responsibility for solid waste); need state enforcement
- contracts that share risks and revenues from sale of recyclables
- same level of service/standard of program services (to increase efficiencies)
- take small units out of it all (private services)

What actions could the State of Wisconsin take to address these factors?

- set minimum service requirements including solid waste collection, recycling (tires, appliances, batteries, oil and '95 banned items), Clean Sweeps and sharps collection; require plans for delivery of cost-effective, comprehensive solid waste and recycling services; require implementation of plan for receiving future \$.
- make any state funding depend on program performance (decrease waste disposed, maximize recovery at the lowest cost) and hold units to standard
- certification and training programs for solid waste and recycling managers.

#### Operations (issues identified)

- population density
- level of service/convenience
- number of lbs./set-out
- per-sort v. commingled
- decrease number of vehicles



- integrated, one-stop processing facilities
- proximity of end-markets for glass and paper
- ability to capture full market value of recyclables
- vehicle capacity and availability of capital/ proximity and access to efficient transportation
- capture rate
- one person crew size
- route design and travel times

What actions could the State of Wisconsin take to address these factors? (this group developed a long-term action plan)

Step 1: Train solid waste and recycling managers in cost-effectiveness and efficiency  
Share/construct facilities across jurisdictions and across political boundaries (Phoenix)  
Public education/awareness campaign for common recommendations

Step 2: Fund research/demonstration of alternative collection and recovery programs  
wet/dry, compaction vehicles, additional material processing) Expand and  
experiment with local markets

Step 3: Ban problem materials (PVC) Review new product introduction for DfE

Step 4: Exempt materials from recycling where not cost-effective (e.g. plastics)

Step 5: Use funding to incentivize consolidation Ban backyard burning and dumping  
Mandate curbside collection, where appropriate (waysides with multi-collection points)  
Eliminate small RUs and assign responsibility to regional utility, with the ability to charge  
tipping fees (treat solid waste like human waste) Link management of recycling  
and garbage services at utility level; differential rates if want to opt out of system.

Competition/Cooperation/Attitude (issues identified):

- public v. private
- competition
- knowledge of program (ability to adapt as programs change)
- cooperation/attitude of generators (education)
- need to spread knowledge that recycling is environmentally friendly (proactive education)
- difficult to quantify environmental benefits
- public v. private paying
- pricing incentives to encourage behavior (ex. VBFs)
- increase manufacturers responsibility to produce recycling friendly products
- duplicating costs, especially between small, adjacent communities (need cooperation)
- increase waste reduction efforts
- overcoming the “we’ve always done it that way” attitude

What actions could the State of Wisconsin do to address these factors?

- reevaluate RUs (consolidating with/within programs)
- state should set standards based on population density (recycling and solid waste), i.e. more than 1000 people must have recycling and solid waste
- reevaluate banned items and Table 1
- continue and revive state education to consumers for recycling, solid waste, special materials, hazardous waste and waste reduction
- education is the primary responsibility of the RU (state needs to revisit/reevaluate including establishing standards for education)

COMMON THEMES (identified by more than one group):

- need for consolidation (RUs)
- education, both for state in general and for program managers
- tie incentives to consolidation/efficiency; eliminate disincentives
- manage solid waste and recycling together
- review banned items for rural v. urban

Meeting Attendees:

NAME	REPRESENTING
Kate Cooper	DNR- Bureau of Waste Management, Madison
Paul Wiegner	DNR- Eau Claire
Jennifer Ketola	DNR- Bureau of Waste Management, Madison
Judy Patton	DNR- Bureau of Community Financial Asst., Madison
Mike Miller	DNR- Wisconsin Rapids
Carol Schmidt	DNR- Oshkosh
John Spangberg	DNR- Cumberland
Steve Brachman	UW-Extension
Wayne Pferdehirt	UW-Extension
George Dreckmann	City of Madison
Dean Swenson	Western WI Recycling Association
Jessica Wanserski	Chippewa County Solid Waste Department
Matt Frank	Waste Management of Northern Wisconsin
Lance Tesch	LB Trucking
Bill Tarmen-Ramcheck	Wauwatosa Public Works

## **External Meetings on Cost Effectiveness, February 1999: Common Themes**

(2/16/99 Meeting held in Wausau)

### **Common Themes**

#### 1. Need for consolidation

- But not necessarily RU's
- Focused on cost effectiveness
- For example, haulers
- Partnering with strong financial incentives
- Market collaboration - long-term vs short-term
- Public sector has need
- Cooperation
- Inhibited by local politics
- Numbers don't prove it - driven by service
- Need oversight / broad perspective
- Economics driven
- Establish economic incentives and policies to encourage cost effective cooperation and consolidation for hierarchy

#### 2. Education

- WA State: cut education and m. development. Lower participation (Waste News)
- Other ways of doing things
- Need both local and regional support
- Already dropped off locally
- Where's the proof? Lots of good examples
- State PSA's - Renew Message
- Expand strategic planning of cost effectiveness (BB \$)
- Research education and training in operations
- Stimulate energy and repeat message
- Target education to businesses regarding benefits of recycling

#### 3. Tie incentives to cost effectiveness

- Grant = per capita
- Reward high diversion rates, based on history and geography - tough to track and implement
- Special project grants
- UBF supplement did not create many changes
- Make it competitive
- Limit reimbursement to high cost communities
- Tie to being part of ISWM system
- Eliminate expense based grants and yard waste eligibility

#### 4. Review banned items - rural vs urban

- Study LCA
- May be necessary if grants eliminated
- Should be replaced by other more cost effective items

## 5. Manage SW and Recycling together

- Needed to fully account for savings and net impacts
- SW license must include similar service levels (like telephone)

## **Cost Study Cities**

- Labor costs may be most significant driver
- High yard waste costs typically result in higher city totals
- Subscription solid waste service cost may be higher (need more communities) and people may not care
- “Higher brackets” may have opportunity for improvement
- Need to compare tipping fees vs cost
- Compare with other “state of the art” programs or national average
- What materials collected

## **Canadian Study - 5 Factors**

- Length of work day
- Time of pick-up
- Set out rate
- Distance between set out
- Weighted average density of material

## **Literature Search Needed - Cost Study**

- If operate own program: How run trucks?
- If privately operated: How is the contract written?
- Need to know why differences: Flesh out case studies

## **Necessary Program Changes**

1. Most haulers provide full service (Rcy & SW) - Level playing field
2. Give municipality legal responsibilities for SW and ability to regulate own waste
3. No new regulatory structure
4. Deposit legislation to encourage more recycling
5. Minimum content laws to encourage markets
6. Figure out how to educate public with no money
7. Eliminate RU's and deal with counties
8. Need for stronger enforcement - what if someone stops?? (10 communities that do not receive grants also currently do not report)
9. Use correctional facilities for plastics

{End of grant and our recommendations - No #2 &3} Clarification Steve?

10. Maximize waste reduction through higher SW costs (tip fees, hauling tax)
11. Level playing field - eliminate state subsidy for virgin materials (forest)
12. Bonding authority for market development
13. Need flexible funding options for municipalities (eliminate expenditure and levy limit caps and create/allow other options)

## **Other Ideas**

State aid contingent on doing what is politically unpopular (e.g. recycling grant for VBF communities)

What if grants end in 2001??

- Some communities will end recycling
- Increase in illegal dumping if too costly
- Use existing infrastructure and let free market set prices
- Madison will continue
- Use DNR Demo grant for cost effectiveness studies

## **Future Steps**

1. Case studies - help from municipalities
2. Share draft of report and review comments
3. Literature search on cost effectiveness

Garbage Summit involving 26 municipalities and stakeholders

## Appendix 7.7. Summary of Survey on Costs of Twenty Five Municipal Programs

(1997 garbage, yard waste, and recycling costs reported by surveyed municipalities to Paul Wiegner, DNR and Jon Tulman, Eau Claire County. Data revised March 12, 1999)

	Garbage		Yard Waste			Recycling				SW, Rcy, YW	Percent Cost Breakdown		
City	Program Costs	Cost per House- hold	Program Cost	Compost Site Cost	Cost per House -hold	Curbside Program Costs	Curbside Costs as % of Program	Total Program Costs	Cost per House -hold	Total Cost per House- hold	SW	Recy	YW
Beloit	\$993,275	\$77.97	\$140,845	\$0	\$11.05	\$447,272	93.5%	\$478,429	\$37.54	\$126.56	61.61%	29.66%	8.73%
Brookfield	\$985,293	\$73.35	\$103,461	\$107,266	\$7.70	\$388,179	95.1%	\$408,179	\$30.39	\$111.45	65.82%	27.27%	6.91%
Chippewa Falls	\$521,926	\$115.91	\$20,784	\$17,329	\$4.62	\$55,000	83.3%	\$66,056	\$14.68	\$135.28	85.74%	10.85%	3.41%
Eau Claire	\$1,963,173	\$107.92	\$15,359	\$15,359	\$0.84	\$480,242	92.4%	\$519,599	\$28.56	\$137.33	78.59%	20.80%	0.61%
Fitchburg	\$209,600	\$52.4	\$59,936	\$10,000	\$14.98	\$148,000	97.8%	\$151,310	\$37.83	\$105.21	49.80%	35.95%	14.24%
Fond du Lac	\$719,398	\$54.92	\$297,343	None	\$22.70	\$426,308	96.2%	\$443,340	\$33.85	\$111.47	49.27%	30.36%	20.36%
Green Bay	\$2,243,000	\$70.91	\$1,819,680	Included	\$57.53	\$773,200	85.4%	\$905,618	\$28.63	\$157.08	45.15%	18.23%	36.63%
Hudson	\$238,058	\$99.98	\$28,000	None	\$11.76	\$67,436	100%	\$67,436	\$28.32	\$140.06	71.38%	20.22%	8.40%
Janesville	\$846,495	\$40.70	\$189,382	\$61,500	\$9.10	\$460,533	92.5%	\$498,070	\$23.95	\$73.75	55.18%	32.47%	12.35%
Kenosha	\$2,285,251	\$83.1	\$250,200	Included	\$9.10	\$811,087	95.9%	\$846,088	\$30.77	\$122.97	67.58%	25.02%	7.40%
La Crosse	\$1,348,000	\$82.95	\$332,229	\$17,836	\$20.44	\$205,000	77.9%	\$263,122	\$16.19	\$119.59	69.36%	13.54%	17.10%
Madison	\$5,637,855	\$95.56	\$2,502,478	None	\$42.41	\$1,636,182	98.2%	\$1,666,829	\$28.25	\$166.22	57.49%	17.00%	25.52%
Milwaukee	\$9,657,720	\$50.04	\$3,163,092	None	\$16.39	\$5,775,980	99.4%	\$5,812,216	\$30.12	\$96.54	51.83%	31.19%	16.98%
Neenah	\$570,1530	\$65.53	\$660,703	\$26,743	\$75.94	\$506,070	93.5%	\$541,330	\$62.22	\$203.70	32.17%	30.55%	37.28%
Oshkosh	\$1,265,319	\$54.61	\$426,144	None	\$18.39	\$500,000	96.6%	\$517,566	\$22.34	\$95.34	57.28%	23.43%	19.29%
Prairie du Chien	\$124,800	\$60.00	\$4,992	Unknown	\$2.40	\$72,631	100.0%	\$72,631	\$34.92	\$97.32	61.65%	35.88%	2.47%
Racine	\$2,020,000	\$71.38	\$527,173	None	\$18.63	\$612,041	93.9%	\$652,041	\$23.04	\$113.05	63.14%	20.38%	16.48%
Steven Point	\$312,784	\$44.68	\$81,246	None	\$11.61	\$225,547	86.2%	\$261,703	\$37.39	\$93.68	47.70%	39.91%	12.39%
Watertown	\$312,642	\$41.69	\$282,281	\$53,765	\$37.64	\$339,981	99.7%	\$340,981	\$45.46	\$124.79	33.41%	36.43%	30.16%
Waukesha	\$850,938	\$49.05	\$368,471	Included	\$21.24	\$401,815	95.3%	\$421,815	\$24.31	\$94.60	51.85%	25.70%	22.45%
Wausau	\$1,017,588	\$71.16	\$267,664	Unknown	\$18.72	\$220,000	82.2%	\$267,664	\$18.72	\$108.60	65.53%	17.24%	17.24%
Wauwatosa	\$1,082,296	\$62.33	\$670,004	\$13,000	\$38.59	\$419,713	96.1%	\$436,911	\$25.16	\$126.08	49.44%	19.96%	30.60%
West Allis	\$1,785,081	\$89.25	\$395,157	None	\$19.76	\$790,874	100.0%	\$790,873	\$39.54	\$148.56	60.08%	26.62%	13.30%
West Bend	\$533,308	\$67.92	\$227,958	None	\$29.03	\$264,166	89.1%	\$296,362	\$37.74	\$134.70	50.42%	28.02%	21.55%
Wisconsin Rapids	\$305,304	\$42.23	\$181,223	\$113,054	\$25.07	\$170,085	92.8%	\$183,281	\$25.35	\$92.64	45.58%	27.36%	27.06%
Column Total	\$37,829,708	N/A	\$13,015,804	\$435,852	N/A	\$16,197,342	N/A	\$16,909,450	N/A	N/A	N/A	N/A	N/A
Average	\$1,513,188	\$65.52	\$520,632	\$39,623	\$22.54	\$647,894	N/A	\$676,378	\$29.29	\$117.35	57.08%	25.76%	17.16%
Standard Deviation	\$2,041,407	\$21.15	\$790,959	\$39,407	\$17.43	\$1,118,219	N/A	\$1,122,379	\$10.03	\$28.13	12.59%	7.55%	10.12%
Maximum	\$9,657,720	\$115.98	\$3,163,092	\$113,054	\$75.94	\$5,775,980	N/A	\$5,812,216	\$62.22	\$203.70	85.74%	39.91%	37.28%
Minimum	\$124,800	\$40.7	\$4,992	\$0	\$0.84	\$55,000	N/A	\$66,056	\$14.68	\$73.75	32.17%	10.85%	0.61%
Median	\$985,293	\$67.92	\$267,664	\$17,836	\$18.63	\$419,713	N/A	\$436,911	\$28.63	\$119.59	57.28%	26.62%	16.98%

## **Appendix 7.8. Shared Vision and Goals to Improve Waste Management Meeting Notes (DNR, UW-Extension)**

### **DNR/UW-Extension Future of Solid Waste Management Work Group**

Planning Meetings - September 18 & 30, 1998

#### **Meeting Summary**

Members of the workgroup met on September 18 & 30, 1998 to develop a “plan for planning” (or planning guidance system) to help them stay focused on the right issues and to guide future meetings. The results of this session follow.

#### **Purposes for Planning**

Initially, the participants discussed what purposes they wished to accomplish by planning together. The following points were agreed upon:

1. To have a vision
2. To channel financial resources
3. To analyze key issues and problems
4. To define a time frame
5. To define roles and responsibilities for plan implementers
6. To guide action/decisions
7. To define problems
8. To involve the public
9. To have public support

#### **Measures of Planning Effectiveness**

Next, the participants discussed what they would look at in order to know if their planning efforts were effective or not. The following points were agreed to.

1. Check in on task accomplishment
2. Are key planners/players actively engaged and balanced?
3. Feedback from broad “public” exists (internal + external people/agencies)
4. Planners modify plan based on public inputs
5. Are planning purposes accomplished?
6. Management support exists
7. Staff support exists
8. Planners receive adequate support

## Planning Outputs

Next, the participants discussed what they would produce as a result of future planning meetings. The following points were agreed upon:

1. Written plan
2. Meetings to solicit input
3. Meetings get documented
4. Commitment and schedule for plan revisions/improvements
5. Management advocacy
6. Staff buy-in
7. Press releases
8. Plan goes on web
9. Draft legislation
10. Fact sheets
11. Budget recommendations
12. Response to legislative mandate
13. External stakeholder support/buy-in
14. A vision for future

## People Involvement

Next, the participants considered who, how and when people should be involved in developing the planning outputs. The following table was agreed upon:

WHO	HOW	WHEN
DNR	<ul style="list-style-type: none"><li>• Develop plan</li><li>• Management support, direction, advocacy from mid/upper levels</li><li>• Budget recommendations/ Legislative initiative</li><li>• Press releases</li><li>• Organize and hold public meetings</li><li>• Generate stakeholder support</li><li>• Develop vision of waste management for Wisconsin</li></ul>	<ul style="list-style-type: none"><li>• At planning meetings</li><li>• Periodically</li><li>• Spring 2000</li><li>• As needed</li><li>• As needed</li><li>• As needed</li><li>• First thing</li></ul>



<b>WHO</b>	<b>HOW</b>	<b>WHEN</b>
UWEX	<ul style="list-style-type: none"> <li>• Develop plan</li> <li>• Research function</li> <li>• Education function</li> <li>• Support process and DNR</li> <li>• Management support</li> <li>• Develop vision</li> <li>• Outreach to stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>• At planning meetings</li> <li>• While planning, as needed</li> <li>• While planning, as needed</li> <li>• While planning</li> <li>• While planning</li> <li>• At start</li> <li>• As needed</li> </ul>
Municipal Sector	<ul style="list-style-type: none"> <li>• Help develop vision and plan</li> <li>• Review, comment, provide input and feedback</li> <li>• Assist in research</li> <li>• Draft legislation/provide advocacy</li> </ul>	<ul style="list-style-type: none"> <li>• At start</li> <li>• At regular intervals</li> <li>• As needed</li> <li>• As needed while plan is being drafted</li> </ul>
State Agencies: DOA, Commerce, etc.	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>
Haulers	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>
Trade Associations (AROW, WMC, etc.), Environmental Groups	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>
Recycling Businesses	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>
Industry - Commercial	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>
General Public	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>	<ul style="list-style-type: none"> <li>• Same as municipal sector</li> </ul>

### Time Table

Next, the participants considered what kind of timeline would be appropriate for their involvement with this project. The following timeline was agreed upon:

<b>9/98</b>	<b>11/1/98</b>	<b>Mid-Nov. '98</b>	<b>12/1/98</b>	<b>1/99</b>	<b>3/99</b>	<b>9/2000</b>
Start	Approve planning system - UWEX/DNR	Define purposes to be accomplished by a waste management plan for WI	Input/feedback from various stakeholders - internal/external	Consider alternative solutions	Respond to Legislative mandate	Finish Plan

## **Getting Started**

Lastly, the participants discussed what they needed to get started with this effort. The following points were agreed upon:

- Understanding from Legislature - This is what we are trying to get at
- Organizational Meeting of Initial Planning Team
- Approval from UWEXIDNR Management to Support Planning Effort
- Find "Planning" Facilitator
- Budget: Time/Money

## **Using This Meeting Summary**

The planning system outlined in this meeting summary is a vital management tool for guiding the planning process and for enabling the planning group to stay focused. The planning system is intended to be used briefly at the beginning and end of each planning meeting. It is flexible and will need to be modified to allow for continual change and improvement, when the planning group agrees to make some changes. This is likely to be needed as soon as the group begins developing the plan, and throughout the entire planning process. Without modification, this planning system will become obsolete.

Facilitated and compiled by:  
Joe Moskal  
Community Development Agent  
UW - Extension, Rock County  
10.2.98

## 8. References

Carroll, Wayne, PhD, *Program Cost Analysis*, UW-Eau Claire, 1996.

Franklin Associates, Ltd., *Wisconsin Waste Characterization & Management Study Update*, prepared for State of Wisconsin Department of Natural Resources, February 1998.

Franklin Associates, Ltd., *Wisconsin Waste Generation & Composition Study Waste Management Study*, prepared for State of Wisconsin Department of Natural Resources, September 1992.

Lovell David L., Senior Analyst, Legislative Council Staff, *Future of Recycling Memo No. 5: Effective Recycling Programs; Factors Affecting Cost and Effectiveness*, October 15, 1996.

McDavid, James C. and Verna Liberte, *The Efficiency of Residential Recycling Services In Canadian Local Governments: National Survey Report*, Local Government Institute, June, 1999.

USEPA, *Cutting the Waste Stream in Half: Community Record-Setters Show How*, June 1999.

USEPA, *draft Wisconsin Recycling Economic Impact Study*, prepared for the Recycling Markets Development Board, 1999 (draft)

USEPA and NY State Department of Health, *Emissions of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from the Open Burning of Household Waste in Barrels*, February 2000.

University of Wisconsin – Extension, Portage County, Mark Hilliker and Gretchen Sierk, *A Survey of Solid Waste Disposal Strategies for Wisconsin Counties*, September 2000.

University of Wisconsin -Extension/Solid and Hazardous Waste Extension Center, Waste Education Series, No. 535.5G.9501, *Improving Cost Efficiencies of Recycling Programs*, January 1995.

Wisconsin Department of Natural Resources, *Managing Used Computers*, PUB WA-420 00, April 2000.

Wisconsin Legislative Audit Bureau, *An Evaluation State Recycling Programs Department of Natural Resources*, Report 01-2, January 2001.

Wisconsin Legislative Fiscal Bureau, *Informational Paper #66: Solid Waste Recycling and Waste Reduction*, January 1999.